



Nordic Council
of Ministers

Nordic land use conference

Alnarp, Sweden, December 10–11, 2025

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Nordic Agri Research (NKJ) and Nordic Forest Research (SNS)

The conference this publication is based upon, was organised by Nordic Agri Research (NKJ) and Nordic Forest Research (SNS)

Nordic Agri Research (NKJ) and Nordic Forest Research (SNS) act as cooperation bodies for the Nordic Council of Ministers, under the Nordic Council of Ministers for Fisheries and Aquaculture, Agriculture, Food and Forestry (MR-FJLS).

NKJ promotes and supports research, innovation and policy development in the agricultural and food sectors as well as reindeer husbandry in the Nordic countries (hereinafter referred to as the NKJ sectors), as part of the Nordic bioeconomy. NKJ supports joint research efforts for sustainable and resilient agriculture, food and reindeer husbandry, increases the knowledge base for research policy and strengthens the Nordic region's position within its area of responsibility in the European research arena.

SNS's mission is to promote, coordinate and strengthen joint Nordic research efforts in forestry, to increase synergies at the Nordic level and to link research to policy by providing well-founded, evidence-based and policy-relevant information to the Nordic Council of Ministers and other decision-makers.



Introduction

Land use is emerging as one of the most pressing and complex policy challenges in the Nordic region. Competing demands for food production, renewable energy, climate mitigation, biodiversity protection, and urban development increasingly converge on the same landscapes. At the same time, land-use decisions are largely made at local and regional levels, while their consequences extend far beyond municipal and national borders. This creates a growing need for coherent policy frameworks, effective governance arrangements, and shared learning across the Nordic countries.

Against this backdrop, the Nordic Land Use Conference was held in Alnarp, Sweden, on 10–11 December 2025. The conference brought together policymakers, researchers, public authorities, and practitioners to explore how land-use planning and governance can better address ongoing environmental change while supporting sustainable development objectives. The conference was organised by Nordic Agri Research (NKJ) and Nordic Forest Research (SNS), two organisations funded by the Nordic Council of Ministers for Fisheries, Agriculture, Food and Forestry, with the aim of contributing to Nordic policy dialogue and future cooperation on land use.

The conference programme combined strategic perspectives with concrete cases. Keynote presentations highlighted the scale and urgency of land-use transformation in the Nordic region, drawing on experiences from Denmark's Green Tripartite Agreement and Norway's soil protection policies. These contributions underscored the need for strong political leadership, clear national steering, and robust knowledge bases, while also pointing to the social and economic challenges involved in implementation.

The thematic sessions focused on three interrelated dimensions of land-use governance. The first explored how the expansion of solar energy can be reconciled with other land-use objectives, emphasising the role of policy design, planning instruments, and Nordic cooperation in reducing conflicts. The second and fourth sessions examined collaborative approaches to functional landscapes, highlighting how dialogue, trust-building, and long-term cooperation among stakeholders can support multifunctional land use and increase acceptance of land-use change. The third session addressed the role of spatial tools and data in decision-making, focusing on legitimacy, usability, and the balance between data requirements and timely policy action.

Each thematic chapter begins by presenting the case studies that framed the session discussions, illustrating how land-use challenges and solutions are addressed in different Nordic contexts. The case presentations are followed by a set

of policy recommendations and a more detailed discussion reflecting the perspectives and experiences shared during the group discussions. Together, the chapters highlight both common challenges and promising approaches across the Nordic countries.

The report points to areas where Nordic cooperation can add value – through shared principles, mutual learning, and coordinated action – while respecting national and local contexts. The report is intended as a contribution to ongoing Nordic dialogue on land use and as a resource for policymakers, authorities, and organisations working to navigate the complex trade-offs shaping Nordic landscapes in the coming decades.

Method

AI was used to transcribe and summarise the opening statement, presentation of the report "[Changes to agricultural land use in the Nordic countries – and future prospects for collaboration](#)" and keynote presentations. The transcripts and summaries have been approved by each presenter. The participants' discussions during the conference's thematic sessions were also transcribed and summarised using AI. The summaries generated of the discussions have subsequently been reviewed, edited, and validated by the author and proof-reader.

Opening of the conference

Aðalsteinn Sigurgeirsson, president of SNS

Aðalsteinn Sigurgeirsson welcomed all participants and framed land use as a fundamental Nordic challenge requiring bridging policy and practice gaps. He stressed that private landowners are primary landscape stewards, and their participation is critical as land use must balance competing demands: Food security, renewable energy, carbon storage, biodiversity protection, and urban expansion. He called for innovative policy, radical transparency, and moving from competing interests to common ground for the next decade.

He explained the conference is backed by Nordic Council of Ministers for Fisheries, Agriculture, Food and Forestry to inform political and policy goals.

Summary of report

Agricultural land use change in the Nordic region

Sofie Andersson, Project Coordinator, NKJ

Sofie Andersson briefly presented the report "[Changes to agricultural land use in the Nordic countries – and future prospects for collaboration](#)". It was published in May 2025 by the Nordic Council of Ministers (Nordpub) and covers 60 years of Nordic agricultural land statistics.

It was highlighted that:

- Agricultural land decreased by approximately 19% since 1961.
- The decline has slowed in the last 20 years but continues.
- Main drivers for the decline are transport infrastructure, residential housing, land abandonment (especially northern regions), forest establishment, green energy installations, and biodiversity protection requirements.
- All Nordic countries share similar planning systems that put the main responsibility with the local authorities. But the countries differ in what type of national steering mechanisms they have to influence or regulate local planning.

The report is a result of a discussion on land use and the reduction of agricultural land that recently emerged among the Nordic countries. The aim of the report is to promote further dialogue and recommendations for future cooperation.

Keynote presentation day 1

Denmark's green tripartite agreement

Henrik Vejre, Professor of Landscape Management at the University of Copenhagen

In short: Vejre's core policy message is that ambitious land-use and climate transitions require strong political consensus, binding regulatory instruments combined with economic incentives, clear national steering with regional implementation, and active management of social and economic impacts.

Henrik Vejre presented the background to Denmark's Green Tripartite Agreement, rooted in the country's long tradition of tripartite cooperation and involving seven actors from government, industry, agriculture, environmental organizations, municipalities, and trade unions. The agreement emerged from a joint initiative between agricultural and nature conservation interests and achieved broad political consensus in the Danish Parliament.

The agreement responds to pressing environmental challenges: Agriculture and land use account for more than half of Denmark's greenhouse gas emissions, coastal waters are heavily polluted by nutrients, and Denmark ranks among the lowest in Europe in terms of protected nature. At the same time, binding EU deadlines for water, nature, and ecosystem restoration legislation are approaching in 2027, while Denmark's Climate Act commits the country to achieving climate neutrality by 2045.

To address these challenges, the agreement commits to transforming 10–15% of Denmark's land area from agricultural use to forest, wetlands, and nature areas by 2045. Key measures include phasing out approximately 140,000 hectares of cultivated peatlands, restoring 100,000 hectares of wetlands, and establishing 250,000 hectares of new forest. Agriculture is to be transformed through support for organic and regenerative practices, increased plant-based production, and

reduced livestock numbers, supported by new policy instruments such as a nitrogen quota system and a CO₂ tax on agriculture, the second of its kind globally.

Implementation is supported by €5.7 billion in secured funding and organized through a new governance structure comprising 23 regional tripartite bodies. All regional transformation plans have been submitted and include mandatory nitrogen reduction measures and compulsory peatland extensification. Peatland phase-out is already around 50% complete and widely considered feasible, while large-scale afforestation remains more uncertain due to its reliance on voluntary participation.

Vejre emphasized that the main challenges are social and economic rather than technical but noted that Denmark has previously carried out comparable land-use transformations. He concluded by presenting an ongoing, multi-dimensional research and monitoring programme, led by himself, which follows implementation, supports selected local processes, and includes action-oriented research in three municipalities.

Keynote presentation day 2

Soil protection in Norway – from national strategy to local implementation

Arne Bardalen, Special Adviser, NIBIO and Agriconsult Nordic

In short: Bardalen urges Nordic ministers to treat food security and soil protection as shared strategic priorities, move from consultation to binding cooperation, and base policy decisions on common data, definitions, and long-term planning.

Arne Bardalen opened his keynote by stressing that soil conservation must be addressed through the lens of food security, which he described as the most fundamental societal function that must be always ensured. Referring to the Norwegian Auditor General's 2023 report, he noted that agricultural land in Norway is still not managed sustainably and that high-quality soils continue to be converted despite long-standing national protection targets.

He placed soil conservation in a global context, highlighting that the Paris Agreement identifies food security and the eradication of hunger as core priorities. As food production systems are highly vulnerable to climate change, emissions reductions and the preservation of productive soils are essential. Since 95–98% of global food energy is produced on agricultural land, soil health is a cornerstone of long-term sustainability.

Bardalen identified three key prerequisites for food security: Resilient domestic production, protection of soils, water and genetic resources, and well-functioning international trade and logistics. He emphasized the Nordic region's role as a reliable supplier to global markets, particularly through Norway's importance to EU seafood supply. At the same time, he noted that current self-sufficiency indicators in the Nordic countries are based on differing national calculation methods, which

limits their comparability and reduces their usefulness for policy development, and emphasized the need for harmonized definitions to support robust and informed food security planning.

He further highlighted growing uncertainty caused by interacting crises, referring to the concept of *polycrisis*, where climate change, geopolitical tensions and market disruptions reinforce each other. This amplifies vulnerabilities in food systems and land use, making soil conservation a strategic national concern. Sustainable and resilient agricultural value chains, capable of delivering safe food even under major disruptions, were described as essential.

Looking ahead, Bardalen stressed that climate change is likely to shift food production pressures northwards as drought and heatwaves intensifies in southern Europe, increasing the strategic importance of Nordic soils. He called for the Nordic Council of Ministers to move beyond dialogue toward binding cross-border agreements on land management and transport corridors, supported by stronger knowledge sharing.

At the municipal level, he advocated for soil protection strategies grounded in robust data and effective communication. In conclusion, Bardalen emphasized that food security and soil protection are inseparable, noting that healthy soils underpin global food production, biodiversity, and the achievement of the UN Sustainable Development Goals.

Thematic Session 1

Balancing solar energy and land use: Policy and practice in the Nordic region

This session explored policy development and emerging research related to the expansion of photovoltaics (PV) in the Nordic region. With increasing demand for renewable energy, particularly solar power, land-use planning was shown to face new challenges in balancing energy production with other policy objectives such as forestry, biodiversity, agriculture, and cultural heritage. The session highlighted policy guidelines and practical examples illustrating how photovoltaics can be integrated into Nordic landscapes in a sustainable and socially accepted manner.

Case presentations

1. Policy development for regulating solar power expansion in Finland

Sanna Andersson, Senior Ministerial Adviser, Ministry of the Environment, Finland

The growth of renewable energy production in Finland has been rapid in recent years, and solar power has stood out with particularly high growth figures. The growth is expected to remain strong since large-scale industrial solar plants start going online. Solar power complements wind power well, as it peaks in summer while wind peaks in winter.

In Finland, solar power projects with a capacity exceeding one megawatt are often classified as industrial-scale installations. Despite its northern location, Finland's solar energy potential is comparable to that of Central Europe. New solutions are also combining energy production with other land uses – for example, agriculture or supporting biodiversity.

Solar energy construction is generally subject to the same regulations as other types of construction. The required land use planning and permits for a project depend on its size, impacts, location, the current land use planning status of the area, and the need to coordinate land use. A new chapter concerning specific provisions for solar power construction is proposed to be added to the Land Use Act (draft Government Proposal was published on 16.5.2025). The draft proposes adding a new chapter on solar power master plans and construction of solar power plants larger than 10 hectares in size would always require a solar power master plan or a local detailed plan. Under the proposed rules, the special conditions for approving construction of solar projects would be evaluated in the master plan process and a solar power master plan would also have to meet a set of special content requirements.

The Ministry of the Environment has also granted financial support to municipalities and regional councils for green transition investment projects, such as land use planning, permitting, and related studies for large-scale solar power production. Through high-quality assessments and land use planning that reconciles various needs and land uses, the aim is to identify the most suitable and promising areas for solar energy development.



Picture 1: by Ville Suorsa/Image bank of the Ministry of the Environment in Finland
Agrivoltaics installation combining solar panels with agricultural production, illustrating how renewable energy generation can be integrated with continued food production and other land-use interests.

2. Agri-PV: Combining agriculture and solar energy in Nordic countries

Espen Olsen, Professor, Department of Physics, Norwegian University of Life

In Agri-PV systems, agriculture is combined with solar PV installations. The aim is to avoid the use of pristine nature for electrical energy production. This combination has gained popularity in southern parts of Europe where solar panels are installed elevated above the field where crops are grown. In this case increase in crop yield can be achieved due to better water management in dry areas. Further north (Germany and The Netherlands) Agri-PV systems are installed as vertically mounted rows of bifacial panels where the crops are grown between the rows, separated by a distance fitted to the machinery used. At NMBU in Ås, Norway such vertical Agri-PV system is installed in the form of a medium-scale pilot rated at 27.4 kWp mounted in the north-south direction harvesting sunlight from the east and west. The system is mounted in an otherwise research-driven field to establish knowledge of the impact of the PV installation on the crop yield of the field. The system is provided by a European commercial manufacturer of such systems (Next2Sun) and was installed during 2025. During the 2025 growing season, two variants of barley has been grown. The results are yet to be evaluated but a problem with the soil quality varying from one end of the installation to the other has been identified. Preliminary results indicate that the growing conditions are not severely impacted by the installation. The issues regarding the soil will be remediated for the 2026 growing season. The system was connected to the grid in October 2025 so no results regarding electrical power production is yet available. A full set of power production data is expected for 2026.

3. Agri- & Ecovoltaics in a Swedish/Danish perspective

Tora Råberg, Researcher, Department of Crop Production, RISE Research Institutes of Sweden

RISE has been a part of several agrivoltaics and ecovoltaic projects during the last years, like Solbruk i Skåne, Eko-sol, Den självförsörjande gården, Solbruk i våra odlingslandskap and the most recent Agrivoltaics in Norrbotten. One of the outcomes from this experience has led to a handbook for ecovoltaics and

agrivoltaics with focus on biodiversity and ecosystem services. There is now a living lab for agrivoltaics with sites in both Sweden and Denmark, where several actions have been introduced to increase the sustainability of the practices. Food crop diversity and areas for pollinators are some of the adaptations. We are also evaluating the function of automatic vehicles in solar parks with sun tracking panel tables. In one of our sites in the living lab we will test gutters for rainwater catchment in the centre of the panel table of a 1-axis system. The aim is to avoid soil erosion and increase the opportunity of returning water as irrigation when it is needed. Several of the sites are planning for energy storage in classical batteries and thermal batteries with one of the sites planning for a greenhouse, using the thermal energy storage in cold periods of the year. There is also testing and upscaling of P2X in one of the farms that we are working with, that has chosen to produce ammonia when the panels produce a surplus of energy compared to the energy demand. This farm has a 2-axis system with orientation to the south as a default. The wheat yield in this farm has been evaluated and showed no significant change in yield as we compared full sun exposure to the semi-shade. Projects are also developing in northern Sweden, where snowy conditions make vertical panels an interesting option.

Group discussion summary

The recommendations presented in this chapter are based on the group discussions held during [Thematic Session 1: Balancing Solar Energy and Land Use: Policy and Practice in the Nordic Region](#).

Core question

- **What national-level policy measures could help ensure that solar power expansion does not create conflicts in rural areas in the Nordic countries?**

Policy recommendations

In short: Overall, the discussion highlighted the role of Nordic cooperation as a facilitator and knowledge broker, supporting coherent approaches, knowledge-based and stepwise development, and better integration between energy, agriculture, and landscape perspectives, while respecting national and local decision-making.

Discussion summary

- **Support Nordic frameworks for AgriPV and EcoPV development**
Participants highlighted the value of Nordic-level support for funding schemes, coordination, and knowledge exchange that promote solar energy solutions capable of coexisting with agriculture, nature conservation, and other landscape functions, rather than contributing to land-use conversion.
- **Facilitate alignment and mutual learning across policy domains**
The discussion pointed to challenges arising from differing national regulatory and subsidy frameworks, particularly where PV installations affect agricultural land classification. Nordic cooperation was seen as a platform for mutual learning, comparison of approaches, and exploration of pathways that better align energy and agricultural policies.
- **Develop shared Nordic guidance and knowledge resources**
There was broad support for developing Nordic guidance materials, such as a handbook or shared principles for agrivoltaics and ecovoltaics, drawing on experiences from across countries to reduce knowledge gaps and support national and local decision-making.
- **Strengthen Nordic support for Living Labs and research infrastructure**
Participants emphasized the value of Nordic collaboration in supporting Living Labs and other test environments where technologies, business models, and land-use interactions can be explored at small scale before wider implementation, including assessments of productivity, climate impacts, and operational effects.
- **Promote Nordic research on multifunctional land-use solutions**
The discussion identified a need for Nordic-level coordination of research on solutions that combine solar energy with biomass production, peatland re-wetting, and diverse cropping systems, as well as system designs that enhance multiple benefits for climate, water quality, biodiversity, agriculture, and energy production.
- **Encourage exchange on social acceptance and conflict dynamics**
Participants underlined the importance of better understanding social acceptance and local conflict dynamics related to solar energy development. Nordic cooperation was seen as well suited to support exchange of experiences, methods, and lessons learned in this area.
- **Use Nordic cooperation as a learning and coordination platform**
The discussion emphasized that Nordic cooperation provides added value through shared learning across diverse geographic and policy contexts. Existing platforms such as SNS, NKJ, and the Nordic Council of Ministers were seen as well positioned to convene relevant actors and support coordination.

Thematic Session 2

Collaborative approaches to functional landscapes (I/II)

This session was the first of two thematic sessions on collaborative approaches to functional landscapes. Both sessions focused on functional landscapes and their potential to integrate production, biodiversity, and other land-use objectives. It explored how collaborative approaches and stakeholder dialogue can help balance competing interests, align policy goals across governance levels, and support multifunctional land use. Drawing on Nordic examples, the session illustrated how cooperation among stakeholders can increase acceptance of land-use change, reconcile public and private interests, and foster innovative solutions. It also considered how successful models and tools could be scaled or adapted to other Nordic contexts.

Case presentations

1. Stakeholder inclusion and involvement in the Hekluskógar project

Hreinn Oskarsson, Head of Department, Land and Forest Iceland

The Hekluskógar (Hekla Forest) project in Iceland is a fine example of successful, large-scale ecosystem restoration driven by robust stakeholder collaboration. The primary goal is to reclaim native birch woodlands in the vicinity of the Mt. Hekla volcano, rehabilitating vegetation cover where it has been destroyed by past unsustainable land-use practices. This endeavour aims to increase the ecosystem's resilience against volcanic ash deposits and combat extensive wind erosion. The project area covers 100,000 hectares, making it a restoration effort of national significance.

Already in the planning phase (2005–2007), the Hekla Forest project used a highly integrated approach to involve key actors and establish shared responsibility. The core project group and subsequent Collaboration Committee were composed of diverse representatives, including key governmental agencies such as the Soil Conservation Service and the Icelandic Forest Service. Furthermore, the committees included representatives from local forestry NGOs and the local farmer forest agency, as well as local landowners.

Local ownership and widespread participation were considered important during the implementation phase. Locals participated in operations, including tree planting and fertilisation. Birch seedlings were granted to land owners for planting in their own land, there among over 200 summer cottage owners in the area, planted approximately one-third of all birch seedlings in the early years. Volunteers, from various NGO's, schools or corporate employee associations were involved. This widespread community participation generated goodwill and publicity for the project.

Today the project is managed by Land and Forest Iceland. The planted areas with birch now cover more than 5.000 ha, and natural regeneration is already widespread in the area. The comprehensive collaborative model of the Hekluskógar project demonstrates how integrating diverse stakeholders is vital for achieving sustainable and functional landscapes, making it a compelling case study for the Nordic region.



Picture 2: By Hreinn Óskarsson, Land og skogur, Iceland

Photo from the Hekluskógar (Hekla Forest) restoration project in Iceland, one of the country's largest ecosystem restoration initiatives.

2. Understanding human values in the implementation of multifunctional landscapes in Denmark

Sara Vangerschov Iversen, PhD, Landscape Ecologist and Tenure Track Assistant Professor, Center for Sustainable Landscapes under Global Change, Aarhus University

As Denmark advances its ambitious Green Tripartite Agreement, the establishment of new Nature-National parks marks a pivotal shift in national conservation policy. These parks are not only emblematic of Denmark's commitment to biodiversity restoration but also serve as experimental grounds for increasingly using natural processes, particularly the use of year-round large grazers as ecosystem managers. This presentation explores how domestic cattle, ponies, and other herbivores are increasingly deployed across Danish landscapes to maintain habitat structure and support biodiversity conservation. While this approach has gained international traction for its ecological benefits, the integration of year-round large grazers into Denmark's evolving nature policy has sparked tensions around competing landscape values, raising critical questions about whose visions of nature are prioritised, and how social acceptance is negotiated amid shifting environmental ideals. Drawing on recent fieldwork, we examine how local communities and nature-based recreational users respond to the changing character of these landscapes. Are large herbivores enhancing the experience of nature, or do they create barriers to access and emotional connection? Our findings suggest that acceptance is highly context-dependent, shaped by local engagement strategies, historical land use, and the visibility of policy goals. By situating this study within the broader framework of Denmark's green transition, we highlight the need for inclusive conservation planning that balances ecological ambition with cultural and recreational values. As Nature-National parks become central to Denmark's new direction in nature management, understanding the social dynamics of landscape change is crucial to their long-term success.

Group discussion summary

The recommendations presented in this chapter are based on the group discussions held during [Thematic Session 2: Collaborative Approaches to Functional Landscapes](#).

Core questions

- **How can planning and decision-making systems be improved to better address environmental change?**
- **How can capacity for collaborative processes at local and regional levels be strengthened to support landscape transitions?**
- **How can national policy better support local collaboration that contributes to environmental objectives?**

Policy recommendations

In short: The proposals call for strengthening cross-sectoral and multi-level governance for functional landscapes, supported by shared Nordic principles for collaborative planning, sustained investment in local and regional capacity-building, and long-term financing and governance models that combine common objectives with local autonomy and where Nordic cooperation adds clear value.

Discussion summary

- **Promote collaborative governance as a prerequisite for functional landscapes**
The discussion underscored that functional and multifunctional landscapes cannot be delivered through sectoral or top-down governance alone. National policies should actively promote collaborative governance arrangements that enable coordination across environmental, agricultural, forestry, energy, and regional development policies. Nordic cooperation can support this by facilitating exchange of models and experiences where public authorities, private actors, and civil society are granted meaningful influence in decision-making processes.
- **Institutionalise early dialogue and local anchoring in land-use planning and policy design**
Participants emphasized the importance of early, structured, and inclusive dialogue with affected stakeholders as a foundation for legitimacy and

effective implementation. Policy frameworks should require and support stakeholder involvement already at the stages of problem definition and goal setting. Nordic cooperation can contribute by developing guidance on participatory approaches that combine direct engagement with representative mechanisms, ensuring both inclusiveness and feasibility.

- **Invest in local capacity-building and trust as strategic policy objectives**

The discussion highlighted that landscape transitions often occur in contexts marked by socio-economic vulnerability and low institutional trust. Building local capacity and trust should therefore be treated as strategic investments rather than ancillary costs. National and Nordic policies should allocate resources for facilitation, coordination, knowledge exchange, and sustained public presence, recognising that without such capacity, ambitious environmental and land-use objectives risk remaining largely declaratory.

- **Shift policy focus from short-term incentives to long-term capacity for action**

While economic incentives can play an important role in initiating change, participants stressed that lasting outcomes depend on strengthening local ownership, competence, and responsibility over time. Policy frameworks should therefore complement financial incentives with measures that support long-term learning, collaboration, and stewardship. Experiences from biosphere reserves illustrate how linking environmental objectives to local identity and values can help make collaborative efforts durable and self-sustaining.

- **Develop long-term and coordinated financing frameworks for functional landscapes**

The group identified a need for financing solutions that are stable over time and less vulnerable to political cycles. Greater coordination of funding across sectors and governance levels – such as water management, land use, and ecosystem services – was seen as essential. Nordic cooperation was identified as particularly well suited to support the development of coordinated financing frameworks and to explore mechanisms that align resources across policy domains.

Thematic Session 3

Spatial tools to support decision and policymaking

This session examined how spatial data, analysis, and modelling can support decision-making in complex and multi-layered land-use contexts. It explored how spatial tools can function as a knowledge base for planning and policy development. Key themes included the integration of diverse data sources, practical applications for land-use planning, and strategies to improve accessibility and usability for decision-makers.

Case presentations

1. Participatory mapping platform for ecological restoration of the Icelandic highlands

Benjamin David Hennig, Professor of Geography, University of Iceland

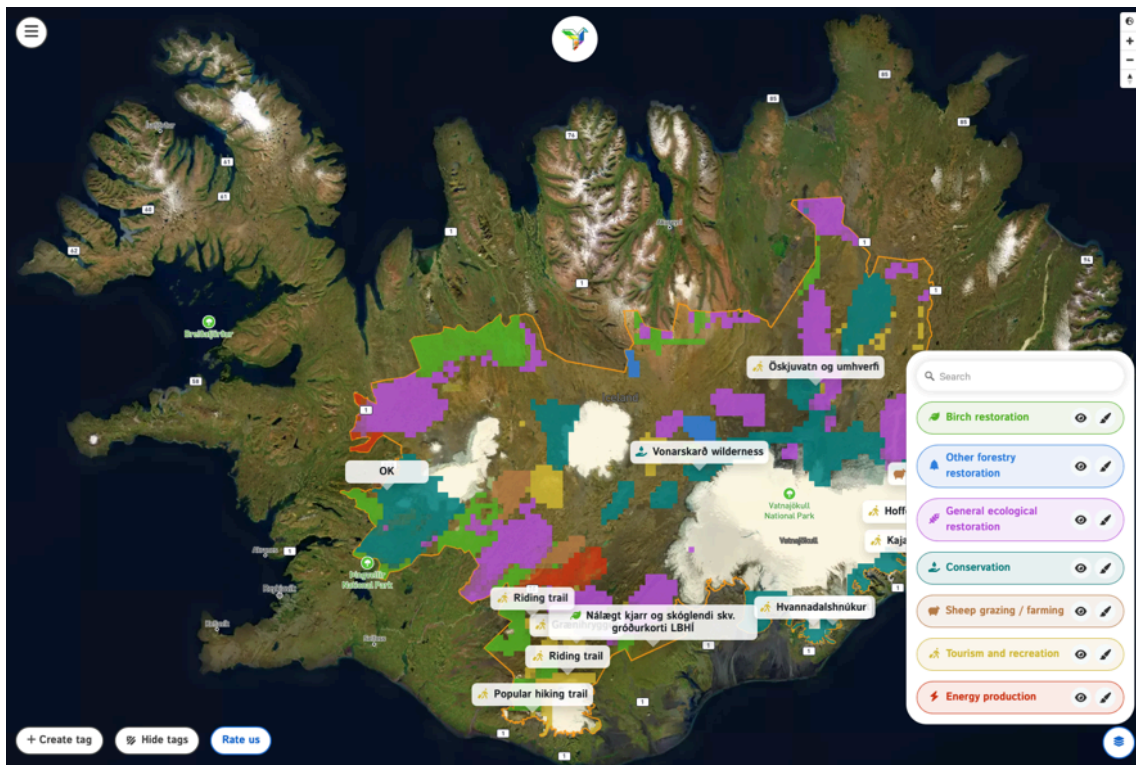
The Icelandic Highlands are one of Europe's largest remaining wilderness areas and central to national debates about energy development, infrastructure, tourism and nature conservation. Within the EU Horizon 2020 project PHOENIX – The Rise of Citizen Voices for a Greener Europe – the Icelandic pilot study brought together two complementary participatory components to explore how democratic innovations and spatial tools can inform long-term land-use decisions in this contested landscape.

The first component is the Highland Game, a digital participatory mapping platform that allows citizens to allocate preferred land-use functions to specific parts of the Highlands. Participants explore trade-offs between conservation, recreation, energy infrastructure or transport routes under simple constraints. The game has been used in public events, enabling participants with no technical background to articulate spatial preferences in an intuitive way. The outputs are

georeferenced datasets that reveal areas of agreement, conflict and shared priorities, which can be compared with existing environmental and planning data.

The second component is a Citizen Jury, a structured deliberative process in which a diverse group of residents learns about Highland land-use pressures, engages with experts and stakeholders, and jointly develops recommendations for the future governance of the area. The jury deliberations use the spatial products of the Highland Game as evidence to support discussion, allowing participants to reflect on public preferences, perceived conflicts and possible “no-regret” areas. The resulting recommendations are communicated to decision-makers and relevant institutions.

Together, these two elements demonstrate how participatory mapping and deliberative mini-publics can be valuable components in strengthening the knowledge base for land-use policy. The approach offers a transferable model for other contexts where large landscapes face competing sectoral claims, and where inclusive and evidence-informed participation is needed to support long-term planning and policymaking.



Picture 3: Screenshot from <https://phoenix-iceland.onesource.pt/en>

Image of the Highland Game from the Icelandic pilot study within the EU Horizon 2020 project PHOENIX – The Rise of Citizen Voices for a Greener Europe.

2. The European wetland map

Cosima Tegetmeyer, Moritz Kaiser, Alexandra Barthelmes, Michael Succow Foundation, Partner in the Greifswald Mire Centre

The European Wetland Map (EWM) improves the current state of knowledge on wetlands across Europe by locating, assessing and merging the latest geospatial data. This is important because wetlands, especially peatlands, play a key role for biodiversity and in climate change mitigation. If undisturbed, they provide crucial ecosystem services. However, many European wetlands have been damaged by drainage. Drained wetlands exacerbate or cause major environmental and socio-economic problems, including soil degradation, floods, droughts and biodiversity loss. In addition, drained peatlands are a strong source of greenhouse gas emissions.

To halt wetland degradation and restore ecosystem functions by enabling adequate policies and management, a good understanding of wetland location and extent is necessary. Many regional, national, and some basic European datasets do exist, but the overall picture was missing. The specific objective of the EWM was thus to elaborate sound multiscale spatial wetland data, mainly by identifying, harmonizing, and integrating available information. The EWM includes data on the distribution and types of floodplains and wetlands – the latter being further distinguished as coastal wetlands, mineral wetlands and peatlands. To create the EWM, spatially explicit information on wetlands was mainly obtained from peatland and soil research publications and European, national and regional administrative databases. The EWM covers the European Union and many additional European countries, including Iceland and Norway.

The EWM brings together existing data into a comprehensive, easily accessible resource to make widespread European wetlands visible and enhance their analysis, understanding and management. The data is compiled per country and is freely available in a Geodatabase in highest spatial resolution and for easier processing as country-wise GeoTIFF collection in lower resolution. For more information, please refer to the technical description ([EWM24 Technical description GMC v5.pdf](#)) and geodata download: <https://doi.org/10.5281/zenodo.14505351>



Picture 4: Screenshot from the European Wetland Map (EWM)

3. Map-based greenhouse gas calculator for spatial planning purposes

**Gunnhild Sjøgaard, Head of Department, Forest and Climate,
Norwegian Institute of Bioeconomy Research (NIBIO)**

NIBIO has developed a map-based greenhouse gas calculator designed to estimate emissions and removals resulting from both current land use and planned land use changes.

The calculator aims to simplify and harmonize the calculation of these emissions and removals for municipalities, counties, consulting firms, developers, state agencies and directorates responsible for land use planning and infrastructure.

Using the calculator enables assessment of the impact of land use and land use changes on emissions and removals, in line with municipal and national goals for reducing greenhouse gas emissions. A key reference is the greenhouse gas accounts for municipalities and counties, prepared by NIBIO on behalf of the Norwegian Environment Agency (2024a).

The map base in this service describes current land use and is compiled from map data from various public data sources. Users can upload land use plans or manually draw and classify areas according to their intended purpose. The service then

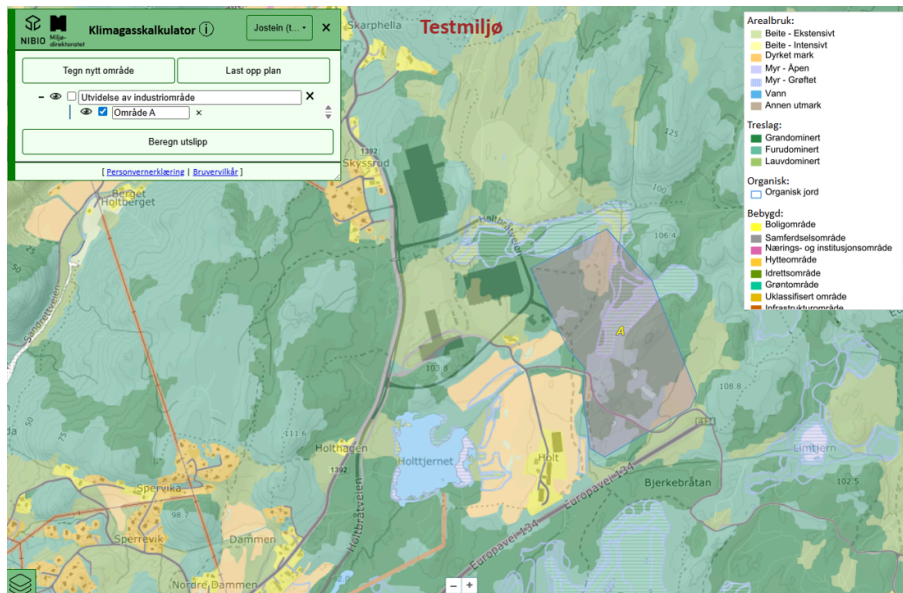
calculates the effects on emissions and removals resulting from both current land use and planned changes, such as new cultivation or afforestation. The calculator's calculations follow IPCC guidelines and the methods used in Norway's national and municipal greenhouse gas accounts for the land use, land-use change, and forestry (LULUCF) sector, as well as recommendations from the Norwegian Environment Agency's Handbook for Impact Assessments (IPCC 2006, IPCC 2013, IPCC 2019, Norwegian Environment Agency 2024b).

The new national planning guidelines for climate and energy in Norway state that the government shall provide knowledge about emissions and removals of greenhouse gases from land use and land use changes. Counties and municipalities, in turn, must obtain knowledge and use it in land use planning. These guidelines increase focus on measures to reduce greenhouse gas emissions and enhance removals from land use and land use changes. This necessitates that knowledge, data, and calculation methods are readily accessible for decision-making processes.

The calculator is currently used by about 100 municipalities in Norway. From January 2026, the calculator will be implemented nationally and will become part of the toolkit used for climate and environmental impact assessments. Since autumn 2025, the service has been further developed through collaboration between NIBIO and the Norwegian Environment Agency.

Website for the service:

<https://nibio.no/tjenester/kartbasert-klimagasskalkulator-for-arealbrukssektoren>



Picture 5: Screenshot of NIBIO's map-based greenhouse gas calculator

The calculator estimates emissions and removals associated with both current land use and planned land-use changes.

Group discussion summary

The recommendations presented in this chapter are based on the group discussions held during [Thematic Session 3: Spatial Tools to Support Decision- and Policymaking](#).

Core questions

- **What governance innovations could strengthen the legitimacy and use of spatial knowledge in policy processes?**
- **What is needed to ensure that spatial tools are scalable and comparable across regions?**
- **How can evaluation and learning be organised to improve the use of spatial knowledge in planning?**
- **What level of granularity is appropriate for spatial data when informing policy?**

Policy recommendations

In short: The discussions highlighted the need to strengthen trust, legitimacy, and practical use of spatial knowledge in policy processes. Rather than prioritising ever more detailed and harmonised data, policies should clarify when comparability and high-resolution data are necessary, and when more aggregated information is sufficient to support strategic direction. Nordic cooperation can add value by supporting shared principles for data use, guidance on uncertainty, and capacity-building for decision-makers, particularly at the local level.

Discussion summary

- **Strengthen trust and legitimacy in the use of spatial knowledge**
The discussion emphasised that the value of spatial tools in policy processes depends primarily on trust, legitimacy, and clarity about how data are used. While technical capacity to collect and visualise spatial data has expanded rapidly, participants stressed that maps only support decision-making when their purpose, assumptions, and uncertainties are clearly communicated. Strengthening transparency and guidance on appropriate use was seen as essential.

- Support local decision-makers as a key link between data and policy**

Participants highlighted that municipal planners and local politicians often operate under strong pressure to prioritise short-term economic benefits over long-term land-use objectives. In this context, spatial tools can either support or weaken decision-making. Targeted capacity-building and training for local authorities were therefore identified as critical to enable informed use of spatial knowledge and to strengthen implementation of agreed plans and policies.
- Clarify when data harmonisation and comparability are needed**

The discussion questioned the assumption that spatial data must always be fully harmonised and comparable across regions. Participants argued that comparability should be driven by policy needs rather than technical ideals. While harmonised data are essential for international commitments and shared Nordic reporting obligations, context-specific approaches may be more appropriate for national and local decision-making.
- Differentiate data needs across policy stages**

A key conclusion was that different levels of data granularity are required at different stages of the policy process. Aggregated spatial information is often sufficient for strategic policy direction, while high-resolution and accurate data become critical during implementation. Inadequate data quality at this stage risks undermining both effectiveness and legitimacy.
- Balance scientific ambition with the need for action**

Participants identified a tension between the pursuit of increasingly detailed data and the need for timely policy action. Excessive focus on data perfection can delay implementation and shift attention from policy direction to technical debate. Aligning data collection with clearly defined policy objectives was therefore seen as essential.
- Use spatial tools for learning and engagement**

The discussion also highlighted the potential of spatial tools as learning and engagement instruments for both decision-makers and citizens. Participatory mapping and visual tools can strengthen understanding of land-use trade-offs, but participants noted the need to complement open participation with more structured and representative forms of engagement.

Thematic Session 4

Collaborative approaches to functional landscapes (II/II)

This session continued the focus on functional landscapes and their potential to integrate production, biodiversity, and other land-use objectives. It explored how collaborative approaches and stakeholder dialogue can help balance competing interests, align policy goals across governance levels, and support multifunctional land use. Drawing on Nordic examples, the session illustrated how cooperation among stakeholders can increase acceptance of land-use change, reconcile public and private interests, and foster innovative solutions. It also considered how successful models and tools could be scaled or adapted to other Nordic contexts.

Case presentations

1. Platform for reindeer husbandry and wind power in Finland

Emma Luoma, Leading Specialist, Akordi

From the perspective of green transition, the northern sparsely populated areas such as the reindeer herding area (RHA) in Finland are seen potential for siting renewable energy production like wind power. While these areas may be sparsely populated, they are in no means "empty": Wind power projects land within the cumulative continuum where reindeer herders have had to adjust to various forms of land uses and are in some cases faced with critical questions on ensuring their livelihood's future. (e.g. Österlin & Raitio 2020; Hast 2021; Hortskotte et al. 2022.)

To deal with the emerging tensions, starting from 2019, the actors from wind power sector, reindeer husbandry, and public authorities have worked together to formulate good practices for the operation of wind power projects in the Finnish RHA including creative ways to assess, mitigate and compensate for the adverse

effects of wind power (Anttonen et al. 2023). Through collaborative process the actors have established an on-going forum where they identify and address common issues beyond singular projects and can organize regional interventions. Throughout the process, collaboration had been supported by Akordi, who acts as a neutral third-party.

So far, the actors have reported that the collaborative forum has increased mutual understanding between the sectors resulting in decreased tensions. Reindeer herders and wind power developers have formulated shared guidelines for operating wind power in the reindeer herding area and collaborated on creating novel solutions e.g. for improving the quality of cumulative impact assessments and utilizing restoration measures to compensate for harmful impacts. The collaborative forum built on neutral ground offers a promising example of a collaborative approach to ensuring fairness in energy transition.



Picture 6: By Akordi

Small group discussion at the collaborative forum between reindeer husbandry and wind power industry in Rovaniemi 2021.

2. Stakeholder involvement for functional landscapes – Biosphere Reserve Kristianstads Vattenrike

Carina Wettemark, Head of the Unit for Biosphere and Naturum and Coordinator, UNESCO Biosphere Reserve Kristianstads Vattenrike & Anna Borgström, project leader

Kristianstads Vattenrike Biosphere Reserve, designated by UNESCO in 2005, promotes sustainable land use through a collaborative landscape approach built on dialogue and partnership. Situated in one of Sweden's most water-rich areas, the Biosphere Reserve works across local, regional and international levels connecting farmers, landowners, municipalities, authorities, schools, researchers, and policy-makers in long-term cooperation. Our mission is to demonstrate solutions where ecological sustainability, social benefits, and viable livelihoods coexist in resilient, multifunctional landscapes.

The pressure on land use is increasing due to climate change, shifting hydrology, agricultural demands and the need to protect biodiversity, requiring integrated approaches beyond single-sector solutions. We therefore work with cross-sector collaboration, iterative dialogue and shared learning to co-develop practical solutions that balance food production, water availability, nutrient reduction, habitat quality and recreation. Trust-building, local ownership, knowledge exchange, and evidence-based decisions are central. Acting as a neutral platform, the Biosphere reserve enables experimentation, conflict-sensitive dialogue and learning between sectors and knowledge systems.

Our wetland case illustrates this approach. A local farmer planned a deep groundwater well to secure irrigation for root crop production, but groundwater in the area is high-quality, vulnerable, and strategically important for long-term resilience. Through dialogue, analysis and landscape-level planning, an alternative emerged: Expanding and optimizing an existing wetland to deliver dual functions - irrigation and ecosystem services. Drainage water and small embankments now deliver water which can irrigate 100 hectares of farmland while the wetland improves nutrient retention and biodiversity. This avoided new groundwater extraction, reduced nutrient leakage, and strengthened ecological connectivity.

This solution was not the result of a single project but of sustained cooperation, trust-based dialogue, and a shared vision between landowners, authorities, and researchers. It demonstrates how multifunctional land use solutions can be co-developed when collaboration becomes the method – not just the goal – delivering benefits for both people and nature.



Picture 7: By Biosfärskontoret

Photo from the multifunctional wetlands in Kristianstads Vattenrike Biosphere Reserve, designated by UNESCO in 2005.

Group discussion summary

The recommendations presented in this chapter are based on the group discussions held during [Thematic Session 4: Collaborative Approaches to Functional Landscapes \(II\)](#)

Core questions

- How can collaboration processes be evaluated to better promote cross-border learning in the Nordic countries?
- What policy and governance measures are needed to support the implementation of research results and successful collaboration models?

Policy recommendations

In short: The proposals emphasise the need to strengthen long-term evaluation and monitoring systems for environmental and landscape-related interventions, align funding and governance structures with the long-term dynamics of environmental change, and clearly distinguish between learning, evaluation, and communication. They further highlight the importance of integrating social science and relational perspectives into Nordic environmental initiatives, and of promoting institutional arrangements that enable sustained Nordic collaboration beyond short-term project-based logics.

Discussion summary

- **Adopt long-term evaluation horizons aligned with environmental change**
The discussion highlighted that many environmental interventions – such as agroforestry, ecosystem restoration, and landscape-based solutions – require evaluation horizons of 15–30 years to generate meaningful insights. Policy and funding frameworks should therefore move beyond short project cycles and support long-term monitoring and learning, including sustained follow-up after pilot and implementation phases. Nordic cooperation can play an important role in promoting evaluation models that reflect the temporal realities of environmental change.
- **Reorient policy selection and scaling criteria toward long-term outcomes**
Participants emphasized the need to align policy selection and scaling decisions with long-term environmental outcomes rather than short-term considerations such as visibility or lobbying interests. Testing solutions through Living Labs and real-world settings before wider deployment was identified as a critical step. The discussion also underscored the importance of strengthening mechanisms that translate existing environmental data into policy-relevant decision-making.
- **Safeguard the independence of evaluation and learning processes**
For Nordic cross-border collaboration, maintaining a clear separation between evaluation, learning, and communication was seen as essential for credibility and trust. Policy frameworks should ensure that evaluation functions are independent from promotional or branding objectives, enabling honest assessment, shared learning, and mutual accountability across countries and institutions.
- **Integrate social science and relational perspectives from the outset**
The discussion highlighted that environmental collaboration is shaped by relationships, power dynamics, and institutional practices that are often overlooked in technically oriented evaluations. Policy and programme design should therefore integrate social science expertise early, ensuring that

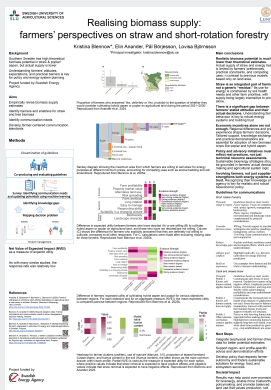
monitoring and evaluation capture how collaboration functions in practice, not only what outputs are delivered. Long-term relationship-building and face-to-face interaction were identified as key enablers of sustained collaboration.

- **Design governance and financing frameworks that enable continuity**
Overall, the session pointed to the need for governance and financing frameworks that prioritise continuity over short-term project cycles. Stable, long-term funding for monitoring, evaluation, and collaboration, combined with institutional arrangements that support durable partnerships, was identified as essential. Nordic cooperation was seen as well positioned to support alignment between evaluation systems, financing mechanisms, and governance structures to translate collaboration into lasting environmental outcomes.

Posters

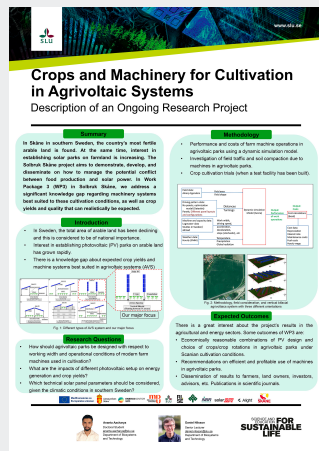
Eight posters were exhibited during the conference, all representing various initiatives that support sustainable land use in the Nordic region.

Realising biomass supply: Farmers' perspectives on straw and short-rotation forestry
by Kristina Blennow & Elin Anander, Swedish University of Agricultural Sciences, Pål Börjesson & Lovisa Björnsson, Lund University



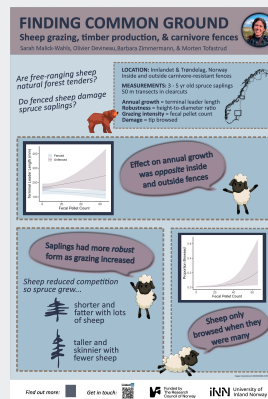
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Crops and Machinery for Profitable and Sustainable Cultivation in Agrivoltaic Systems in Southern Sweden – Description of an Ongoing Research Project
by Ananta Acharya & Daniel Nilsson, Swedish University of Agricultural Sciences



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FINDING COMMON GROUND: Sheep grazing, timber production, & carnivore fences
by Sarah Malick-Wahls, Olivier Devineau, Barbara Zimmermann, & Morten Tofastrud, University of Inland Norway



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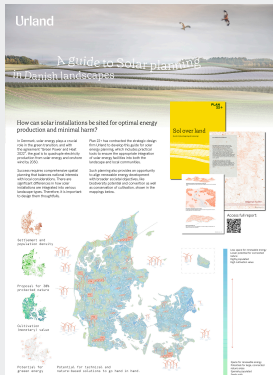
Unlocking the Economic and Social Potential of AgriPV Systems in Denmark
by Addisu Anteneh Dilnessa & Pedersen, S.M., Copenhagen University, Jørgensen, J.R., Gislum, R., Rasmussen, C., Andersen, M.L., Vedde, J., Højgaard, M.I., Aarhus University & Pedersen, M.L., Slagelse Municipality



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A guide to solar planning in Danish landscapes

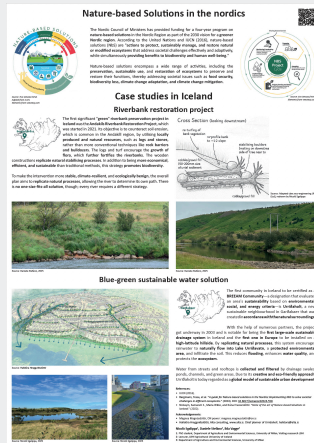
by Vilde Vangdal, Urland



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Nature-based solutions in the Nordics

by Nicolò Sgalippa, Daniele Stefano, Agricultural University of Iceland & Ilda Vagge, University of Milan



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Landbrugssamarbedje – Land Stewards in the North-Atlantic

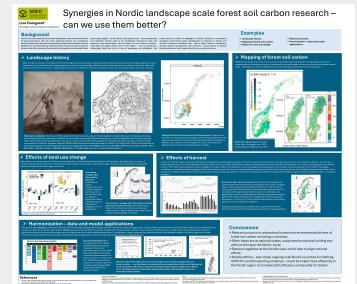
by Sigurður Torfi Sigurðsson, The Icelandic Agricultural Advisory Centre



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Synergies in Nordic landscape scale forest soil carbon research – can we use them better?

by Lise Dalsgaard, NIBIO



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