News and Views

from Nordic Forest Research SNS

7-8 2019

The soil holds twice as much carbon as the atmosphere. Photo: Mats Hannerz.

Soil as a carbon sink

Increasing carbon storage in the soil is considered one of the most cost-efficient measures to reduce climate impact. Besides, soil carbon has a positive impact on biodiversity and the environment.

Commissioned by the Nordic Council of Ministers, NKJ and SNS have compiled a report with suggested actions to increase soil carbon storage further. The report, published on the SNS webpage, gives an overview of the subject in the Nordic region.

More carbon than in the air

The soil holds about three times more carbon than plants, and twice as much as in the atmosphere. Small changes in the soil carbon balance can therefore have a great impact on the climate. A higher carbon content in the soil also increases fertility, leading to greater crop productivity.

Changes in the carbon store will be reported in the National Inventory Report as required by The Intergovernmental Panel on Climate Change (IPCC) and the Kyoto protocol. The report details national emission and absorption levels as well as changes in storage. The sector "Land Use, Land-Use Change and Forestry" (LULUCF) is an essential component in the carbon budget. Annual changes in the carbon store are reported in three different areas: living biomass, dead organic material and soil carbon.

The most important carbon sink

Finland, Sweden and Norway report positive net carbon sequestration in the LULUCF sector. Forest soil is the most important carbon sink.

In Denmark, the forest soil has previously been a carbon sink, but is now a source due to the country's aging forest and high proportion of young trees. Losses from agricultural soil have decreased in Denmark as a result of more organic material being recycled to the soil.

The report "Markens potential som kolsänka" (in Swedish) and the popular version "Soil as a carbon sink" (in English) can be downloaded from SNS webpage.

In Iceland, LULUCF is the sector with the highest emissions of greenhouse gases, due to a high proportion of fields and pasture land on drained soil.

In Norway, the highest emissions in the LULUCF sector come from agricultural land and urban

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Soil carbon, cont.

exploitation. In Sweden, emissions from the soil originate primarily from drained peatlands.

Actions to increase carbon sequestration

The impact of changes in land use is often uncertain, but the report, nevertheless, lists a number of actions that will have effects on the soil carbon:

- Restoring drained peatlands to wetlands reduces carbon emissions and nutrient leakage. Drained peatland is an important source of greenhouse gases. Land with the highest emissions should be the focus of action. Fertile forest peatlands emit more gasses than poor peatlands, and farm fields more than pastures.
- Till-free agriculture increases carbon storage. Soil preparation involving tilling should be reduced or avoided.
- Perennial hay, clover and other herbage for fodder improves the soil as a carbon sink. Protection zones and intercropping further increase the positive effects on soil carbon.
- Recycling organic material to the soil is positive. This can be residues from crops, compost or manure.
- Afforestation and reforestation affect the soil carbon in many ways, the outcome depends on factors such as type of trees and the water table. It is therefore difficult to assess the effect of forest regeneration.

Global initiative

If the soil carbon content increased by 0.4 % per year, all emissions from fossil sources would be sequestered. Therefore, an initiative to increase soil carbon was launched at the 2015 Paris climate conference. The purpose of the "4 per 1000" initiative is mostly to make the important role of soil carbon visible.

More research is needed

Recently, there have been academic disputes about soil carbon. Researchers from SLU question the potential of direct seeding and till-free cultivation, although single studies have suggested positive effects. Recent research has shown that fallow land can become a carbon source, but changes to a carbon sink if cultivated. The findings show that much more research is needed to understand how carbon is stored and emitted from the soil. Cooperation between Nordic countries plays a vital role since their soil conditions are comparable.

New efforts from NKJ and SNS

The report suggests a number of actions for NKJ and SNS:

1. A Nordic seminar series discussing state of the art of research, a digital hub for soil carbon, policies and target conflicts, development of Tier 3-methods and models to visualise impacts.
2. A Nordic research programme with focus on carbon storage and emissions from the soil.

The report "Markens potential som kolsänka" (written in Swedish) was produced by AB Stelacon with Dr. Maria Tunberg as project leader. A popular brochure is available in English.. Download from https://nordicforestresearch.org

National inventory reports from the Nordic countries

All of the Nordic countries are obliged to report national emissions and uptake to the EU and UNFCC (United Nations Framework Convention on Climate Change). Data and monitoring originate from institutions such as universities and ministry departments.

- **Denmark**: Aarhus University is responsible. Data are collected from the Danish Meteorological Institute, Statistics Denmark, the Danish Agricultural Agency and Copenhagen University.
- **Finland**: Statistics Finland compiles the National inventory report. Data originate from the Natural Resource Institute Finland (LUKE).
- **Iceland**: The Environment Agency of Iceland is responsible. Soil carbon balance is calculated by the Agricultural University of Iceland with data from the Soil Conservation Service and Icelandic Forest Service.
- **Norway**: the Norwegian Environment Agency is responsible for the national report. The Norwegian Institute of Bioeconomy Research (NIBIO) calculates the soil carbon values and other data are collected from the Meteorological Institute.
- **Sweden**: The Swedish Environmental Protection Agency is responsible. The Swedish University of Agricultural Sciences (SLU) collects the data and performs the modelling. Statistics Sweden, the Swedish Environmental Research Institute and Swedish Meteorological and Hydrological Institute are also part of the reporting group.

Carbon accounting models

There are three levels ("tiers") in the IPCC classification of the methods for emission calculations. The highest level, the most advanced models, are often adapted for regional conditions. At the level Tier 3, the uncertainty is generally reduced, but the calculations are often more complex.

The models used in the Nordic countries vary in complexity. Examples of Tier 3 models are:

- **ICBM** – Introductory Carbon Balance Model (Sweden, used for agricultural soils)
- **C-tool** (Denmark, applied to agricultural fields with at least 6% carbon)
- **Yasso07** soil carbon model (Finland, initially developed for the forest sector but also applied to agricultural land).

Extreme weather – how does it affect Nordic forestry?

STOP - after the fire in central Sweden. Photo: Mats Hannerz.

The Nordic forest fires in 2018 were an eye-opener, exemplifying the consequences of climate change in forests. The joint experiences and suggestions for cooperation efforts have been brought together in a new report from SNS.

Sweden was the most seriously affected country in 2018, with about 23,000 hectares of forest burnt. The burnt area was lower in Norway and Finland, but the fires still affected a far greater area than the average for the preceding five years. The costs associated with the damaged forest are estimated to be 4 million NOK in Norway and 900 million SEK in Sweden. Forest fires like those in 2018 can be expected to become more common in a warmer climate, particularly in the southern part of the region.

Report from working group

The Nordic Council of Ministers decided in September 2018 to convene a working group, tasked with analysing the challenges related to more extreme weather conditions. The group has members from Norway, Iceland, Denmark, Finland and Sweden, and has been led from within the SNS secretariat. A report was presented to the ministers in August 2019.

Exchange of experiences and cooperation between the Nordic countries is important to prepare for coming events.

The report "Det nordiska skogsbruket – utmaningar i en framtid präglad av mer extremväder" (in Swedish) can be downloaded from the SNS webpage. A policy briefing in English is also be available: https://nordicforestresearch.org

Five proposals from the working group

1/ **How to avoid** forest fires – more information. The Nordic countries need to share experiences and information related to reducing the risk of forest fires.

2/ **Rapid actions** – identify and extinguish fires at an early stage. Sharing experiences and possible cooperation with control and identification among the countries. A pilot study with suggestions for a comprehensive project is proposed.

3/ Increase **knowledge about the forest** amongst emergency services. Not all Nordic countries have forest fire training courses, but more can be done on a trans-national level.

4/ The entire forest sector shares responsibility. **Forest fire training** needs also to be directed to NGOs, the military defence forces, forest owners and foresters.

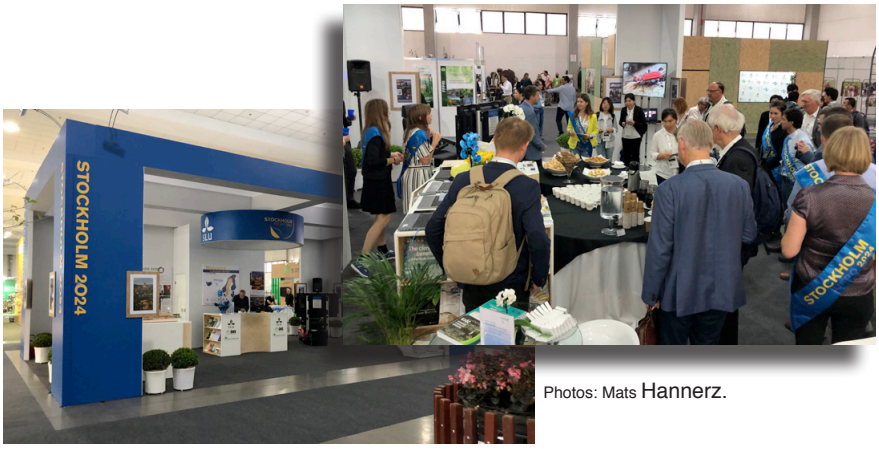
5/ Long term **forest management efforts are crucial. The silvicultural effects on fire risk need to be better known, and conflicts between** production economy, biodiversity, landscape planning and forest fires targeted. More knowledge exchange among the Nordic countries is required.

The Stockholm pavilion greeted welcome to Northern Europe

The IUFRO World Congress 2019 in Curitiba was an excellent platform for the Nordic forest sector to mark the next congress, IUFRO 2024, which will be held in Stockholm, Sweden, in collaboration with all Nordic and Baltic countries.

The pavilion, strategically located near the entrance of the exhibition hall, was crowded with visitors during all of the congress days. SNS and SLU manned the booth and provided visitors with handouts and valuable discussions. Komatsu gave all a chance to drive a harvester in a simulator, and the Speakers corner had a full schedule of short presentations from representatives for all of the Nordic and Baltic countries.

Read more: www.nordicforestresearch.org



Photos: Mats Hannerz.

Side-event about the Nordic forestry model

SNS was responsible for a side-event in Curitiba with a panel discussion covering the theme "Forests and Society Towards 2050 – a Dilemma for the Nordic Model". Moderated by Fredrik Ingemarson from SIFI (the Think Tank for International Forestry Issues), panel members from China, Brazil, African Forest Forum, IFSA (the student organization) and Norway elaborated the megatrends that will affect the forest sector the nearest few decades. Jan Heino, previous head of the Forestry department of FAO, introduced and summarized the session.

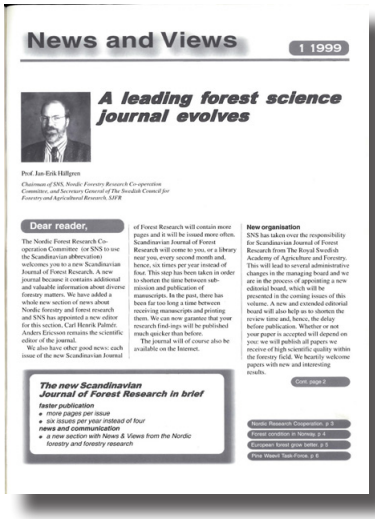
News & Views, 20 years of condensed Nordic research

The first issue of News & Views saw the light in early 1999, along with a new look for the scientific periodical Scandinavian Journal of Forest Research. The newsletter, reporting on SNS activities, has subsequently been integrated into the journal.

The idea from SNS was to "inform readers about and comment upon research and research programs, and communicate major political, ecological and commercial developments affecting the forestry sector." Initially, six issues were published each year, increasing to eight issue per year from 2012.

All previous newsletters can be downloaded from the SNS webpage. These can be regarded as a historical archive of what has been going on in Nordic forest research, with descriptions of research projects, interviews with board members and experts, shortcuts outlining Nordic forest research and also international perspectives.

Read more on:
https://nordicforestresearch.org/news-views/


News and Views 1 1999

A leading forest science journal evolves

Dear reader,

The new Scandinavian Journal of Forest Research in brief

faster publication
- more pages per issue
- six issues per year instead of four

news and communication
- a new section with News & Views from the Nordic forestry and forestry research

New organisation

The very first issue of News & Views.

Contact News & Views

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More info about SNS:

www.nordicforestresearch.org

News & Views is a newsletter from SNS containing short, popularized articles covering Nordic forest research and forestry. Articles presenting SNS-supported activities are prioritized. The newsletter is published eight times per year, and is available for download from the SNS and Scandinavian Journal of Forest Research websites.

SNS Nordic Forest Research

News & Views is written, edited and produced by Mats Hannerz, Silvinformation AB