



Implementing the Selfoss declaration

Recommendations to Nordic forestry

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Nordic co-operation

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and three autonomous areas: the Faroe Islands, Greenland, and Åland.

Nordic co-operation has firm traditions in politics, the economy, and culture. It plays an important role in European and international collaboration, and aims at creating a strong Nordic community in a strong Europe.

Nordic co-operation seeks to safeguard Nordic and regional interests and principles in the global community. Common Nordic values help the region solidify its position as one of the world's most innovative and competitive.

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1. Introduction



In August 2008 the Nordic ministers and secretaries of state responsible for forestry from Denmark, Finland, Iceland, Norway, Sweden and Åland met at a conference in Selfoss, Iceland. The topic of the conference was the importance of forests in facing up two of the most important environmental challenges of our time: global climate change and the global administration of freshwater resources. Special reference was given to the Mt Hekla afforestation project in Iceland where forests have been restored on denuded areas that were created by interaction of volcanism and deforestation. The conference concluded with a ministerial declaration – the Selfoss Declaration on sustainable forestry.

The aim of this report

The aim of the present report “*Recommendations for follow-up of the Selfoss declaration on forests, climate and water*” is to give recommendations to the Committee of Senior Officials for forestry of the Nordic Council of Ministers (CSO (Forestry)) and other relevant actors within the field of Nordic forestry co-operation as to how the Selfoss Declaration can be implemented and followed up.

This report presents work that has been carried out by an ad hoc group, appointed by the Committee of Senior Officials for forestry of the Nordic Council of Ministers (CSO – Forestry). The mandate for the ad hoc group is found in Appendix I.

The ad hoc group outlined the objectives of the study in answer to the question: how might forests and forestry in the Nordic countries, in a sustainable way, affect and be affected by:

- climate through
 - mitigation of climate change
 - adaptation to climate change
- freshwater resources

The report is divided into three sections.

Section *one* gives an introduction to the report, presents the working group, the aims of the report and describes how the background data, being the basis for the policy recommendations, was collected and analysed.

Section *two* includes the Selfoss Declaration and its appendix that clarifies the individual resolutions. It further presents the proposed policy recommendations for implementation of the Selfoss Declaration.

Section *three* provides background information for the proposed policy recommendations and an in-depth analysis of the challenges presented in the declaration. It proceeds with highlighting the contrasts between the Nordic countries on issues pertinent to the Selfoss Declaration and the potential synergies by co-operating on these issues. The existing Nordic mechanism of co-operation is described and how the issues addressed by the declaration fit into that framework. The report addresses in more detail the principal issues of the Selfoss Declaration with emphasis on current policies and research efforts.

The ad hoc working group

The appointed members of the ad hoc group are:

- *Jón Geir Pétursson*, Ministry for the Environment, Iceland, chairman
- *Pernille Karlog*, Ministry of the Environment, Denmark
- *Sune Haga*, SamNordiskSkovforskning secretary, Finland and SNS
- *Birgitta Naumburg*, Ministry of Agriculture, Sweden (Sweden presidency 2008)
- *Tore Skrøppa*, Norwegian Forest and Landscape Institute, Norway and NordGen Forest
- *Danfríður Skarphéðinsdóttir*, Ministry for the Environment, Iceland, representing the Nordic Committee of Senior Officials for Environmental Affairs (CSO-Environment)

The secretary of the group is Hrefna Jóhannesdóttir, project co-ordinator of CSO (agriculture and forestry).

In addition to the group, Mikael Sandvik, at the Government of Åland, Forestry Section, was consulted on issues raised in the present report.

As co-author of the report, Mr. Þorbergur Hjalti Jónsson, forest scientist at the Icelandic Forest Research, Mógilsá, compiled and synthesized relevant information on issues covered in the Selfoss Declaration, collected background data and assisted in the analyses

Methodology

The group held 6 formal meetings during 2009 and 2010, in Reykjavík 28th March, again in Reykjavík 30th June, in Stockholm 10th September, in Reykjavík 21st October and in Copenhagen 27th November and 29th January 2010.

The group undertook a mapping process in order to highlight the current state of affairs within and among the Nordic countries on policy, law and regulation, implementation and research relevant to the Selfoss Declaration. The group analysed the Selfoss Declaration, identifying the key issues presented. On the basis of that analysis a formal questionnaire was devised and sent to the signatory countries. The countries were asked to clarify policies, law and regulations, implementation and research relevant to the key issues of the Selfoss Declaration and provide copies of documents or web links relevant to their replies. The response to the questionnaire and the documents provided, as well as other documents retrieved during the work, form the background data used for writing the present report and provided the basis for the policy recommendations.

The questionnaire used is enclosed as Appendix II.

The Selfoss Declaration on sustainable forestry

The Nordic Council of Ministers – The Ministers of Forestry. Ministerial declaration adopted in Selfoss, Iceland 19th August 2008

At their meeting on 19th August 2008 in Selfoss, Iceland, the forestry ministers from Denmark, Finland, Iceland, Norway, Sweden and Åland discussed sustainable forestry, with the focus on water and the climate.

The use of the Nordic forests has had a unique significance for the development of Nordic welfare society.

The people of the Nordic Region have a close relationship with the forest. Since the beginning of time, the forest has provided mankind with protection, material for houses and buildings, energy and food from plants and game. In the modern era, the Nordic forests constitute a resource for economic development in the Nordic Region. The forest is also important for biodiversity and recreation. This shows very clearly the forest's many values and functions.

The forest is linked to two of the most important environmental challenges of our time: global climate change and the global administration of freshwater resources. The Nordic forestry ministers – who were gathered for

a conference in Selfoss, Iceland, on 18–19th August 2008 – want to highlight the importance of the forest in facing up to these two challenges.

The Nordic forestry ministers note that viable forests, which generate raw materials and services for industry, a diversity of plants and animals, as well as a place for recreation, are a prerequisite for competitive forestry in the Nordic Region. In addition, the forestry ministers:

- *want*, taking into account the forest's biological diversity and leisure potential, to *work towards* increased sustainable biomass production in the Nordic Region's forests, which is an important measure in counteracting climate change and reducing the competition between cultivation of biomass for bio-energy and for other purposes
- *place great weight on* protection and care of forests with the aim of safeguarding the eco-system, biodiversity and the groundwater, as well as counteracting erosion and protecting watercourses
- *note* that afforestation ought to be increased and that forest management and the use of wood be developed as the basis of the starting point in the joint European guidelines in order to create viable forests and thereby counteract the negative consequences of climate change
- *place weight on* the forestry sector participating actively and constructively in the discussion of the forest's role in a climate context in order to facilitate the optimum use of the forest's potential and ensure that any measures taken are based on sustainable forest management
- *wish to* strengthen co-operation and the sharing of experiences within the Nordic Region, so that Nordic forest users have access to and knowledge about how they can, in a way that is efficient in terms of resources, take care of the forest's water and how they can adapt forest management as a consequence of climate change
- *stress* the importance of tree breeding, including genetic adaptation to climate change and the adoption of new measures whenever necessary
- *place great weight on* the forest's local and regional importance for healthy economic development, e.g. income from tourism and hunting, which is a prerequisite for active forest management and thereby a further development of the forest's importance in a climate and water-management context
- *support* the idea that forests which aim, for example, to protect against erosion or preserve biological diversity or are planted to rehabilitate eroded fields, should also be capable of being used for timber production, as long as this contributes to looking after the forests' ecological, social and economic values
- *note* that high-quality research and innovation is required in all of these areas, and that closer Nordic co-operation *is required* for Nordic forestry research to remain at the forefront of forest research in an international context in the future as well.

Bórunn Sveinbjarnardóttir, Minister of the Environment, Iceland

Eskil Erlandsson, Minister of Agriculture, Sweden

Troels Lund Poulsen, Minister of the Environment, Denmark

Ola T. Heggem, Secretary of State, Norway

Jouni Lind, Secretary of State, Finland

Jan-Erik Mattsson, Member of the Åland Cabinet

Appendix to the Selfoss Declaration

Forest and water quality

Water is the basis for all life on Earth, and it is becoming ever more clear that access to clean drinking water is a prerequisite for a good quality of life. Forests help to slow the flow of surface water and efficiently filter pollutants out of sources from which water is extracted. At the same time, the forest improves conditions for fish in lakes and watercourses by serving as a source of nutrition for water organisms. A good guarantee for productive water eco-systems, high-quality water and less risk of flooding is that the forest in the outflow area is used in a manner that is sustainable in the long term with reference to the water.

Forests – bioenergy, higher energy prices, globalisation

The people of the world understand that oil resources are not inexhaustible. The constantly increasing demand for oil means that it is a major question how long the sources will last. There are strong reasons for believing that rising oil prices will result in the forest becoming an important energy resource. Increased production of biomass in the forest is desirable and also takes into account the forest's ecological and social values.

The forest as counterbalance to climate changes – carbon sinks

Concern about climate change is widespread throughout the world, and it is clear that emissions of CO₂ into the atmosphere must be combated with every means at our disposal. Most countries have targets for reducing emissions of greenhouse gases and are developing strategies for reducing net-emissions. Measures to reduce emissions are based, amongst other things, on the forest's great potential for binding CO₂. Deforestation must therefore be stopped and the forest's production capacity increased by means of improved management. This is also the case in countries where opportunities exist to increase the forestry area through afforestation, and where there is no strong competition for land from, for example, food production.

The forestry sector's adaptation to climate changes

Despite all of the measures taken to reduce greenhouse gas emissions, it is probable that significant climate changes will take place because the CO₂ content of the atmosphere has already increased significantly. It is reasonable to expect, amongst other things, changes to the frequency of storm damage in the forest, droughts, forest fires and damage from insects as a result of climate changes. The forestry sector must adapt to such environmental changes and in this context stronger research will play a very important role.

Genetic adaptation of trees

Trees have an incredible ability to adapt to climate changes. However, this process can take a long time, and it is probable that climate changes are happening so quickly that the genetic adaptation of the trees is not keeping up. We have good knowledge of the Nordic forests' adaptation and genetic variation, but it is important to improve this knowledge significantly in order to improve the basis upon which decisions are made about which species of tree, and of which provenance, will be the most usable in a changed environment.

Protection from erosion – “Hekla's forests”

The forest binds soil and thereby prevents deflation and soil erosion. In parts of the world with a deforestation problem, there are now large eroded areas without vegetation. This creates environmental problems for these countries and their inhabitants and it is therefore important to increase afforestation in order to protect fields and combat erosion. Such problems also occur in the Nordic Region of today, including in Iceland.

Emphasis on research

Research is a prerequisite for good results in forest preservation and management. Without research, development and innovation, the outcome will be stagnation and decay. Internationally, the Nordic countries are prominent in forest research and development. In order to safeguard that leading position in the international forestry sector, we must work towards strong Nordic forest research in the future.

2. Recommendations for implementation of the commitments of the selfoss declaration



The declaration consists of nine, partly interrelated, resolutions highlighting the Forestry Ministers' priorities.

The ad hoc group gives the following recommendations of the commitments of the Selfoss Declaration. The recommendations are twofold, first policy recommendations to the Nordic co-operation structures and second, direct measures that include different activities undertaken by different Nordic actors. The formulation of the recommendations is based on the analyses presented in Section III.

The group does not in most cases suggest exact time limits for the different activities, but proposes that the responsible actors consider the different measures right away.

Structural policy recommendations for the Nordic co-operation structures to facilitate implementation of the Selfoss Declaration

The ad hoc group considers that the current Nordic Forestry co-operation structures are functional and highly capable of meeting the challenges raised by the Selfoss Declaration and to execute the direct measures proposed.

Many of the issues raised in the Declaration are already on the agenda for Nordic forestry co-operation. However, the following policy priorities are recommended to ensure implementation:

- The Nordic Forest Research Co-operation Committee (SNS) shall continue to bring together Nordic competence within the scope of the Declaration. A preferable way of seeing this materialised is to facilitate the activities of specific Centres of Advanced Research (CAR) within the field of forests and climate and water.
 - This is directed to the SNS board to consider and to follow up on.
- SNS shall promote co-operation with Nordic Energy Research (NEF) and the Nordic Joint Committee for Agricultural Research.
 - This is directed to the SNS board to follow up on.
- The ad hoc group welcomes the recent initiative to connect SNS with EFI and urges that the collaboration will focus on projects that include the interrelations between the forests and water and climate
 - This is directed to the SNS board to follow up on.
- NordGen Forest will gain a stronger position within NordGen as the need for adaptation of forest trees to climate change is inevitable in coming years.
 - This is directed to the NordGen board to consider and follow up on.
- Given the importance of the Nordic forests for the climate commitments of the Nordic countries, there should be a strengthened collaboration between CSO-Environment and CSO-Forestry on climate change issues. It is the task of CSO-Environment to develop Nordic climate change strategies and contribute to the climate change negotiation.
 - This is directed to both CSO-Environment and CSO-Forestry to consider and follow up on.
- It is important that NMR shall not further reduce already dwindling budgets to SNS and NordGen, but rather increase the budgets so that SNS and NordGen can co-ordinate high-quality Nordic forest research in networks and projects.
 - This is directed to CSO-SAM and CSO-Forestry to consider and follow up on.
- The ad hoc group suggests SNS and NordGen Forest seek collaboration with the different inter-sectoral strategies within Nordic co-operation activities on issues related to forests, climate change and water. This will facilitate implementation of the resolutions of the Selfoss Declaration. The group emphasises the following strategies and areas of concern: Sustainable development, the Baltic Sea, Globalisation initiative, Neighbours both to the East and West (and perhaps other strategies)
 - This is directed to CSO-Forestry, the boards of NordGen and SNS to follow up on.

2.1 Specific measures recommended for implementation of the Selfoss Declaration

On the basis of the analyses, provided in Section III, the ad hoc group has made a list of recommended activities. Table 2.1 summarizes the proposed measures. The measures are not presented in any order of priority and the numbering provided is only for ease of reference. The decision on priorities and which of the proposed measures are to be implemented and to what degree is that of CSO Forestry.

Table 2.1. Recommended measures to implement the commitments of the Selfoss Declaration

Measure	For implemen- tation of reso- lution number	Proposed activity	Brief description
1	1,2 and 3	Workshop	How to increase sustainable forest biomass production
2	5	Desk study	How can forest management practices meet and adapt to demanding effects of climate change
3	5	Seminar	The EU water framework and Nordic forestry
4	4	Web portal	To collect and disseminate research results relevant to the Selfoss Declaration
5	9	Promotion and publication	To promote and inform about the importance of forests for climate and water
6	3 and 4	Workshop and publication	Advancing the potential of the Nordic forests to mitigate climate change
7	3	Desk study	Analyses and publication of forest management strategies to increase climate change mitigation in the different types of forests found in the Nordic countries
8	3	Desk study	Study and recommendations on how the pan-European guidelines for afforestation/reforestation could be applied in the Nordic countries.
9	3	Workshop	Workshop on how the use of Nordic wood in permanent constructions can be promoted
10	8	Desk study	Good practice examples of forest restoration of degraded areas
11	8	Workshop	Forest protection, including new alternative forms of forest protection
12	6	Project, field trials	Develop reproductive materials for future climatic conditions
13	6	Collaborations and exchange	Increased co-operation in Nordic forest tree breeding and breeding research
14	6	Desk study	Monitor possible changes in genetic diversity of forest tree species under changing climate conditions
15	2	Desk study	Collecting good examples of how biodiversity conservation is integrated into forest policy and practice in the Nordic countries.
16	2 and 1	Desk study – contribute to measure 1.	The importance of dead and decaying wood for forest biodiversity
17	2,3 and 6	Desk study	Risk assessment of new forest tree species
18	2	Information system	Risk analyses and establishment of a system to address potential pathogens in Nordic forestry as a result of climate change
19	2,3 and 7	Desk study	Collect and analyse examples of afforestation/tree planting projects in the Nordic countries where the benefits from carbon management have been one of the driving force
20	7	Conference	Local and regional importance of the Nordic forests

Measure 1

Activity: Nordic workshop

Topic: How to increase sustainable forest biomass production?

This measure relates to points 1, 2 and 3 of the Selfoss Declaration.

The workshop should focus on how the Nordic countries can increase the sustainable production of biomass in their forests. The aim is to increase awareness of what is feasible today and what might be possible in the future. As the basis for a workshop, a survey carried out on the present possibilities and what is already being done in the Nordic countries. Such a mapping could be implemented by SNS. Efforts should also be based on results from earlier NMR projects in the subject area, e.g. a publication of what has been considered and discussed during the workshop, and including suggestions for further action that should be developed with the goal of being submitted to the Ministerial Conference in Norway 2011 (FOREST EUROPE, formerly MCPFE).

Target group: Scientists, forest and environmental authorities, forest owners' associations, forest industry, environmental and recreational organisations.

Due date: In order for the publication to be completed by June 2011, this would require the workshop to be held in spring in 2011 at the latest and the survey to be carried out no later than during the winter 2010.

Responsibility: CSO-Forestry

Proposed funding: CSO-Forestry, NMR Chairmanship funding and funding from the sustainable development funding source

Measure 2

Activity: Desk study

Topic: How can forest management practices meet and adapt to demanding effects of climate change?

This measure relates to point 5 of the Selfoss Declaration.

Compilation of knowledge on how to adapt forest management in the Nordic forests to climate change. The study should provide answers on the following issues: (a) How forest management is conducted today in the Nordic countries; (b) What changes we envisage as necessary to forest management in the Nordic countries; (c) Recommendations on how Nordic forest can adapt forest management and whether it requires action from the forest or public sector. The results from this work will be properly disseminated so that the knowledge reaches the forest sector in the Nordic countries.

Target group: Nordic forest owners, Nordic forestry ministries and CSO-forestry.

Due date: 2011

Responsibility: SNS (Nordic Forest Research Co-operation Committee)

Proposed funding: Nordic co-operation on globalisation, Sustainable development funding, CSO-forestry, NMR chairmanship, SNS

Measure 3

Activity: Nordic seminar

Topic: The EU water framework and Nordic forestry.

This measure relates to point 5 of the Selfoss Declaration.

A seminar on how Nordic forestry will be affected by the EU Water Framework Directive and how forestry can contribute to the implementation of the directive. A paper which should be used is the Swedish Forest Board's report on this subject, published 31 March 2010. Other relevant documents can be obtained from water authorities and research summaries. The seminar should have speakers from the forestry sector, environmental NGOs, governments and the Commission. A publication on issues raised and discussed will be developed. Primary target groups for dissemination include the Nordic forestry sector and the Nordic forestry ministers.

Target group: Trade associations of forest owners in the Nordic countries.

Due date: Second half of 2011.

Responsibility: CSO-forestry.

Proposed funding: CSO-forestry in co-operation with CSO-Environment

Measure 4

Activity: Desk study and web publication

Topic: To collect and disseminate research results relevant to the Selfoss Declaration

This measure relates to points 5 and 9 of the Selfoss Declaration.

Extensive research has been conducted in the Nordic countries on the topics of the Selfoss Declaration. During the collection of data for this report, a vast amount of ongoing and completed studies was made available from different institutions in the Nordic countries. This activity would collect such information and build up a web platform on the SNS web. This should preferably be done in coherence with the Baltic Sea Action and focus on both Baltic and Nordic data. This could related to the ongoing project proposal by SNS called "Opbygning af nordisk-baltisk videntjeneste indenfor skov og skovbrug".

Target group: A wide audience, especially forest scientists and the Nordic forest and natural resource sectors.

Due date: As soon as possible

Responsibility: CSO-Forestry with partners SNS, EFINORD

Proposed funding: SNS

Measure 5

Activity: Promotion and publication

Topic: To promote and inform about the importance of forests for climate and water.

This measure relates to point 9 of the Selfoss Declaration.

The ad hoc group notes that the role of forestry in mitigating climate change is very important and should be emphasised on every forest organisation's information agenda: "Forests are superior for carbon sequestration and are as renewable nature resources to be used for all kinds of wood products and bioenergy." The same applies to the management of freshwater resources. This would be in the form of two accessible leaflets or small brochures, one on forests and climate and one on forests and freshwater, that could be distributed in relatively large numbers written in all the Nordic languages. Existing information on how to put ideas into practice should be collected and used.

Target group: A wide audience, especially policy and decision makers in environmental and natural resources sectors.

Due date: As soon as possible

Responsibility: CSO-Forestry, with collaboration with SNS and NordGen Forest

Proposed funding: CSO-Forestry

Measure 6

Activity: Workshop

Topic: Advancing the potential of the Nordic forests to mitigate climate change

This measure relates to point 3 of the Selfoss Declaration.

A workshop that explores the potential of the Nordic forests to mitigate climate change. There is considerable climate mitigation potential in the Nordic forests. That potential can be greatly enhanced, both within the current forests as well as by expanding the forest cover and further by increasing the use of wood. The workshop should focus on the climate mitigation potential in Nordic forests and how it can be advanced. The objective is to gain and share knowledge about the Nordic countries' key policies, experiences and key challenges regarding the mitigating role of forests.

The workshop should aim for a publication, preferably a TemaNord number. The output will be of relevance for a wide audience in the Nordic countries, as well as for communication outside Norden. It should be considered as input to the proposed Forest day 5 at the UNFCCC COP 17 conference in South Africa in 2011.

Target group: This should be a large Nordic workshop/conference that brings together forest policy makers, forest authorities, environmental authorities, the scientific community, forest owners, and key actors in the UN climate negotiations in the Nordic countries.

Due date: By 2011

Responsibility: CSO-Forestry. Seek partnership with CSO-Environment.

Proposed funding: CSO-Forestry, The respective chairmanship, CSO-Environment.

Measure 7

Activity: Desk study

Topic: Analyses and publication of forest management strategies to increase climate change mitigation in the different types of forests found in the Nordic countries.

This measure relates to point 3 of the Selfoss Declaration.

The Nordic countries have implemented a range of forest strategies and direct measures to mitigate climate change. This activity suggests SNS collect examples from all the Nordic countries on forest management strategies and measures that have been put in place to counteract climate change. The examples should aim at representing strategies from different ecological zones to counteract climate change

This should be published by NMR and distributed by the respective forest authority at the national level.

Target group: The national forest authorities and the forest owners.

Due date: Flexible

Responsibility: SNS, delegated to relevant CAR (Centre of Advanced Research)

Proposed funding: SNS

Measure 8

Activity: Desk study

Topic: Study and recommendations on how the pan-European guidelines for afforestation/reforestation could be applied in the Nordic countries.

This measure relates to point 3 of the Selfoss Declaration.

There are newly published guidelines by FOREST EUROPE (formerly MCPFE) for afforestation/reforestation with a special provision for the United Nations Framework convention for climate change (UNFCCC). The guidelines are based on a wide perspective, being applicable for all countries in Europe. Therefore analysis of the relevance of the guidelines for Nordic forestry is needed, especially of the compatibility with current Nordic policies and practice. This should be a desk study that examines the compatibility of the MCFPE guidelines for afforestation/reforestation in the Nordic countries and gives more to-the-point recommendations for the Nordic countries.

Target group: The Nordic forestry authorities and extension services

Due date: Flexible, but urgent.

Responsibility: SNS implements. Suitable for a qualified forestry consultant.

Proposed funding: SNS

Measure 9

Activity: Nordic workshop

Topic: Workshop on how the Nordic wood in permanent constructions can be promoted

This measure relates to point 3 of the Selfoss Declaration.

There will be a considerable climate mitigation gain if the immediate release of CO₂ is delayed by using wood for permanent structures. The workshop aims to facilitate the use of wood for permanent constructions. It will do so by highlighting this important component of forest climate change mitigation, and explore and share Nordic experiences.

Target group: Representatives of the wood processing industry, forest authorities

Due date: Flexible

Responsibility: CSO-Forestry

Proposed funding: CSO-Forestry, the respective presidency country

Measure 10

Activity: Desk study

Topic: Good practice examples of forest restoration of degraded areas

This measure relates to point 8 of the Selfoss Declaration.

This activity encompasses the study of good examples on how forests can be applied to restore degraded areas in a sustainable way. This would include both current as well as historical examples, and aim to draw attention to the fact that productive forests established on denuded areas require long term management objectives. In the Nordic countries, there is a long experience of establishing forests on eroded and degraded land. Examples are the old Danish plantations to curb sand dunes, Icelandic efforts to rehabilitate and afforest eroded areas, and the efforts of many Nordic countries to restore mine/gravel areas, etc.

Target group: A wide audience, Nordic, European and international, in the field of forestry and restoration of degraded landscapes

Due date: Flexible

Responsibility: CSO-Forestry initiates. SNS implements in collaboration with EFI. There might be an interest in communicating this with the EU.

Proposed funding: CSO-Forestry and SNS

Measure 11

Activity: Nordic workshop

Topic: Protection forestry – Hekla's forests

This measure relates to point 8 of the Selfoss Declaration.

Forests deliver a range of ecosystem services such as timber production and biodiversity. This point sets the focus on the multiple environmental provisions of forests established for protection purposes and how such forests can

deliver material products as well. A workshop will be arranged with the focus on protection forestry – e.g. forests planted to protect soil, landslides, wind, water control (protective forest).

Target group: A wide audience, including Nordic forestry, agricultural, environmental and land use authorities and extension services

Due date: Flexible

Responsibility: Joint workshop with CSO-Forestry and CSO-Agriculture with the focus on forests and soils.

Proposed funding: CSO-forestry and CSO-Agriculture.

Measures 12, 13, 14
Introduction

General background and motivation for increasing efforts in the management and conservation of forest genetic resources

The genetic diversity of forest trees plays a key role in maintaining the resilience of forests to threats and in taking advantage of opportunities. The wise use of this genetic diversity also provides flexibility with respect to forest management and adaptation strategies for climate change. Even if trees have an incredible ability to adapt to climate changes, this process can take a long time, and it is probable that climate changes are happening so quickly that the natural genetic adaptation of the trees is not keeping up.

Two different strategies that can be used for accelerating the adaptation of forest trees to the climatic changes are by seed transfer followed by promotion of local adaptation of potentially suited reproductive material, and by forest tree breeding. Tree breeding utilises the large genetic variability of forest tree species to produce reproductive materials with a higher survival, volume and quality production and with sufficient genetic diversity, and also has potential for developing reproductive materials with resistance to pests and insects. In this field there is an obvious potential for co-operation, as parts of the Nordic region have large similarities in climatic conditions. Including other countries in the Baltic Sea Region in such co-operation should be considered.

Measure 12
Activity: Field trials
Topic: Develop reproductive materials for future climatic conditions

This measure relates to point 6 of the Selfoss Declaration.

Establish populations of selected forest tree species, especially broadleaved, that in future can be used as seed sources, based on reproductive materials from regions with climatic conditions similar to expected conditions in the region in order to secure adaptability to changing climatic conditions. Decisions should be made based on knowledge from earlier and presently on-going research and development programmes.

Target group: Nordic forest scientists

Due date: Flexible

Responsibility: Facilitated by GENE CAR (SNS) and NordGen Forest in collaboration with relevant national actors responsible for providing reproductive materials

Proposed funding: NordGen and SNS, EU (Strategy for Baltic Sea Region)

Measure 13

Activity: Collaboration and exchange

Topic: Increased co-operation in Nordic forest tree breeding and breeding research.

This measure relates to point 6 of the Selfoss Declaration.

Establish and maintain a network with members from the breeding and research organisations to obtain beneficial co-operation in breeding of Norway spruce and other important forest tree species of the Nordic countries. Safeguard that tree breeding is done in a sustainable and scientifically sound way.

Target group: Nordic forest geneticists

Due date: Flexible

Responsibility: NordGen Forest, GENE CAR (SNS) and national breeding organisations

Proposed funding: EU (Strategy for Baltic Sea Region) and CSO-forestry

Measure 14

Activity: Desk study

Topic: Monitor possible changes in genetic diversity of forest tree species under changing climate conditions.

This measure relates to point 6 of the Selfoss Declaration.

Investigate whether it is feasible to collect seed lots of populations of selected forest tree species to be put in long-term storage, e.g. in the Svalbard Global Seed Vault, as reference materials for future genetic studies. The study should use the Nordic tree species as an example, but wider ambitions would include the global tree seed material.

Target group: Nordic forest geneticists and policy makers

Due date: As soon as possible

Responsibility: CSO-forestry and NordGen board, NordGen Forest

Proposed funding: CSO-forestry and NordGen

Measure 15

Activity: Desk study

Topic: Collecting good examples of how biodiversity conservation is integrated into forest policy and practice in the Nordic countries.

This measure relates to point 2 of the Selfoss Declaration.

Forestry in the Nordic countries is generally considered to be managed on a sustainable basis with a balanced account of the many benefits forests can provide: biodiversity, timber, biomass, recreation, clean groundwater, landscaping, and so forth.

Good examples from all the Nordic countries will be collected on how biodiversity and forest management are co-ordinated and how forest management can be developed for the benefit of the continued conservation of biodiversity. Results will be issued in a publication with images for use in the MCPFE conference in Oslo in 2011 and (if achievable) to the CBD COP 10 in October 2010.

Target group: Wide audience including scientists, forest and environmental authorities, forest owners' associations, forest industry, environmental and recreational organisations

Due date: Flexible

Responsibility: CSO-Fisheries, Agriculture, Food and Forestry

Proposed funding: CSO-Forestry, CSO-Environment and funding from the Sustainable development funding source

Measure 16

Activity: Desk study

Topic: The importance of dead and decaying wood for forest biodiversity

This measure relates to points 1 and 2 of the Selfoss Declaration.

The United Nations declared 2010 to be the International Year of Biodiversity. A key indicator of biodiversity in forests is deadwood. Deadwood is vital for a multitude of organisms in forest ecosystems. There is a potential conflict between leaving deadwood in forests for the benefit of biodiversity and the desire to increase the use of forest biomass for energy purposes. To select the portion of the biomass which may be infected by destructive pests can, on the other hand, be a contribution to improving forest health and safeguarding biodiversity.

The complexity of the problem is best described by collecting experiences and research results on different types of deadwood impact on forest biodiversity and by developing proposals for prioritization of what kind (size, species, standing / lying) of deadwood should be left in the woods, and in what areas (humidity conditions, soil, etc.) it is of particular importance for biodiversity to leave deadwood in forests. Experience will be gathered in electronic form and will provide the input to a seminar on improving sustainable use of biomass from forests (see activity under Selfoss Declaration, section 1). The study would include systematic comparisons between the policies and actions being taken in the Nordic countries involving deadwood in the forest. The comparison would enable the countries to learn from their collective experience.

Target group: Scientists, forest and environmental authorities, forest owners' associations, forest industry, environmental and recreational organisations

Due date: Flexible

Responsibility: SNS

Proposed funding: SNS, funding from the Sustainable development funding source) and the Working Group on Terrestrial Nature under MC-Environment.

Measure 17

Activity: Desk study

Topic: Risk assessment of new forest tree species

This measure relates to points 2, 3 and 6 of the Selfoss Declaration.

Globally, invasive species are currently considered one of the greatest threats to biodiversity. Examples of non-native tree species that are considered to have become invasive in forests in Denmark include the mountain pine (*Pinus mugo*) and black cherry (*Prunus serotina*). These have been identified as major ecological problems and large resources are spent on combating the unwanted spread of these species. Under changing climatic conditions there will be increased interest in introducing new tree species, many of which are expected to thrive well in a warmer climate and used in sustainable forestry. Experience from other countries or regions on how introduced species will perform will be useful to consider when introducing new species into Nordic forests.

Collect information on experience with risks pertaining to the introduction of new tree species in forestry. The experience will be gathered from countries or regions where the climate and growing conditions are predicted to be similar to the Nordic countries, following global warming.

Experience will be included in a project, as applied under the Baltic Sea Strategy:

“Management and conservation of forest tree genetic resources in the Baltic Sea. Region under changing climate conditions”

The study would also involve a systematic comparison between the Nordic countries of policies and actions being implemented on issues of non-native tree species, forest conservation and the role of forests in climate change. The purpose of this comparison is that the Nordic countries should be able to learn from their collective experience

Target group: Scientists, forest and environmental authorities, forest owners’ associations, forest industry, environmental and recreational organisations

Due date: Flexible

Responsibility: CSO-forestry and NordGen Forest

Proposed funding: CSO-forestry, CSO-Environment, SNS and the sustainable development funding source

Measure 18

Activity: Risk analyses and information system

Topic: Risk analyses and establishment of a system to address potential pathogens in Nordic forestry as a result of climate change

This measure relates to point 2 of the Selfoss Declaration.

With a changed climate, and the possibility of new species of trees and (or) provenances, there is an increased risk of new pests spreading in Nordic forests. There is already a responsible authority in place to prevent the introduction of harmful species of diseases and pests (such as a Plant Directorate). A Nordic warning/information system for new, *potentially* harmful pests and diseases is lacking.

Opportunities to develop a warning system for potential pests in forests will be studied. The study should illustrate how such a system is best developed, and how and by whom it should be operated and maintained.

Target group: Scientists, forest and environmental authorities, forest owners' associations, forest industry, environmental and recreational organisations

Due date: Flexible

Responsibility: PATHCAR with the participation of entomologists

Proposed funding: CSO-forestry, CSO-Environment, SNS and the sustainable development funding source

Measure 19

Activity: Desk study

Topic: Collect and analyse examples of afforestation/tree planting projects in the Nordic countries where benefits from carbon finance have been the driving force.

This measure relates to points 2, 3 and 7 of the Selfoss Declaration.

Afforestation, ground water and carbon sequestration. Afforestation in peri-urban areas is particularly well suited to ensure cleaner groundwater, while the new forest can provide other benefits to the cities and their citizens. Private landowners, industry, etc. could be further motivated to engage in afforestation projects, if it is possible to receive credits for the CO₂ sequestered by the new forest.

An analysis will be prepared, based on the collection of good examples of how the Kyoto Protocol quota system can be used to promote afforestation.

Target group: Scientists, forest and environmental authorities, forest owners' associations, forest industry, environmental and recreational organisations

Due date: Flexible

Responsibility: CAR-ES (or its successor)

Proposed funding: CSO-forestry, SNS, CSO-Environment (Climate and Air Quality Group)

Measure 20

Activity: conference

Topic: Local and regional importance of the Nordic forests

This measure relates to point 7 of the Selfoss Declaration.

A conference that focuses on the local and regional importance of Nordic forests. It may be difficult to quantify the value of the various dimensions of sustainability. It is easiest to quantify economic growth, while sociological development and environmental protection values are harder to measure. Since the Nødebo declaration in 2005, a working group under the Nordic Council of Ministers has been working on strengthening the dialogue on the local values of forests (*skovens lokale værdier*) and how to make the values more visible to authorities and to the public. The work on “Skovens Lokale Værdier” under the Nordic Council of Ministers is an ongoing process. Among the projects related to the subject, was a conference hosted by Iceland in September 2009, *Forestry serving urban societies in the North Atlantic Region*.

Target group: Wide audience including scientists, forest and environmental authorities, forest owners’ associations, forest industry, environmental and recreational organisations and local authorities.

Due date: 2011/Flexible

Responsibility: CSO-forestry.

Proposed funding: CSO-Forestry, CSO-Food, NMR Chairmanship funding and funding from the sustainable development funding source.



3. Forests and forestry in the the Nordic Countries



This section gives a short overview of Nordic forests and the role of forests in the respective countries. It gives quantitative information about forest area, timber volume and key ecological attributes and further, describes the forest tenure structures.

3.1 Nordic forests

In the five Nordic countries, forests and open woodlands cover 66.8 million hectares or more than half (53%) the total land area (Table 3.1). However, these forests are not very evenly distributed. Almost the entire area of Nordic forests and woodlands (99%) is in Finland, Sweden and Norway and primarily so in Sweden and Finland (81% of total Nordic forest area).

Forests and open woodlands cover 69% of the land area of Sweden and Finland and about 37% of the Norwegian land area. Denmark and Iceland are much less forested with only 13% and 1% forestland cover, respectively (Table 3.1). Åland, a Nordic autonomous territory and a signatory to the Selfoss Declaration, has a land area of about 155,000 ha and 67,000 ha of productive forests (43% of land area). Taken as a whole, there are about 2.7 hectares of forestland for every inhabitant of the Nordic countries. However, in Denmark and Iceland there is less than 0.5 ha per person (Table 3.1).

The Nordic forests are at different stages of transition in the individual countries. Forest cover in Sweden and Finland has been relatively stable for a long time, while in Norway forest cover has been increasing.¹ In Denmark there are ambitious goals to expand the forests so that “forest-landscapes” will cover 20–25% of the land area within 80–100 years. Iceland, which to date is almost denuded of trees, has even more ambitious plans to expand the overall forest and woodland cover from 1% to 12% of the overall area.

Table 3.1 Areas of forests and open woodlands (1.000 ha), percent forest cover of total land area (forests and woodlands) and forest area per person in the five Nordic countries.

	Denmark	Finland	Iceland	Norway	Sweden	Nordic	%
Forests ^{*1}	570	22,500	25	9,387	28,203	5,9940	90%
Other wooded land ^{*2}	48	802	85	2,613	3,044	6,893	10%
<i>Total forest</i>	<i>618</i>	<i>23,302</i>	<i>110</i>	<i>12,000</i>	<i>31,247</i>	<i>66,834</i>	<i>100%</i>
% forest cover	14%	69%	1%	37%	68%	53%	
<i>Total land area km² *3</i>	<i>43,090</i>	<i>338,140</i>	<i>103,000</i>	<i>323,760</i>	<i>449,960</i>	<i>1,257,950</i>	
Per person	0.1	4.4	0.4	2.6	3.4	2.7	

Source: FAO, country statistics 2005 (except data for Denmark)

*1 Forest: Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ.

*2 Other wooded land: Land either with a tree crown cover (or equivalent stocking level) of 5–10 percent of trees able to reach a height of 5 m at maturity in situ; or a crown cover (or equivalent stocking level) of more than 10 percent of trees not able to reach a height of 5 m at maturity in situ (e.g. dwarf or stunted trees) and shrub or bush cover. *Excludes:* Areas having the tree, shrub or bush cover specified above but of less than 0.5 ha and width of 20 m, which are classed under “other land”. Land predominantly used for agricultural practices. It excludes land occupied by “trees outside the forest”.

*3 Total land: Land area km², including water.

Forests and ecological zones

The Nordic countries fall into three vegetation zones; 1) the treeless arctic and alpine zones, 2) the boreal zone dominated by coniferous trees and 3) the nemoral zone in its natural state characterized by deciduous broad-leaved trees.

In the Nordic countries mountain birch woodlands and scrub (*Betula pubescens* var. *czerepanovii* (syn. *B. p.* Ehrh. var. *pumila* (L.) Govaerts)) form the boundary between the treeless arctic and alpine tundra and the boreal forests. The mountain birch tree-line boreal-sub-zone extends from the Kola Peninsula of North West Russia, across Finland, Sweden, Norway and Iceland to South Greenland. Fragments of similar birch woods are also found in the highlands and islands of Scotland. This tree-limit belt of deciduous woods is limited to the North Atlantic as in most parts of Siberia and North America the boreal coniferous forests tend to form the limit to the tundra.

The trees of the mountain birch sub-zone are generally of a contorted form and variable stature from prostrate shrubs to trees of up to 12 meters high. In Northern Scandinavia wide-ranging scrub-woods, with trees three to five meters tall, cover dry and infertile sites. In Iceland about 80% of the mountain birch is scrubland with trees of two meters or less.

¹ Gudmundur Halldorsson, Edda Sigurdis Oddsdottir and Bjarni Didrik Sigurdsson (editors). *Affordnord. Effects of afforestation on ecosystems, landscape and rural development*. TemaNord 2008:562. 118p.

Rowan (*Sorbus aucuparia*), aspen (*Populus tremula*) and tea leaf willow (*Salix phylicifolia*) grow interspersed with the mountain birch in Iceland, Norway, Sweden and Finland. In Scandinavia grey alder (*Alnus incana*), bird cherry (*Prunus padus*), goat willow (*Salix caprea*) and *S. borealis* also grow to tree size in the mountain birch woods.

In Norway, Sweden and Finland, most of the area defined as open woodlands is sub-alpine mountain birch and in Iceland mountain birch is the only indigenous woodland type. Overall, the mountain birch woods are about 10% of the woodland cover in the Nordic countries. Since the settlement of Iceland in the late ninth century, about 2 million hectares of mountain birch woodlands have been lost due to deforestation. In Denmark no mountain birch woods exist and open woodlands are generally mixed scrubby stands in heath lands.

Boreal forests cover most of Finland, Sweden and Norway. The principal species are the evergreen conifers Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*). Downy birch (*Betula pubescens*), silver birch (*B. pendula*), aspen (*Populus tremula*), gray alder (*Alnus incana*), rowan (*Sorbus aucuparia*), bird cherry (*Prunus padus*) and goat willow (*Salix caprea*) are deciduous trees commonly encountered in the boreal forests. Scots pine generally dominates dryer sites and in the North, while Norway spruce is the principal conifer species on more mesic and southerly sites.

The boreal trees generally attain a height of 20–35 m or more and are usually monocormic and with straight stems. Norway spruce may attain an age of over 300 years and Scots pine up to 500 years or more. The boreal broadleaves rarely survive for more than 100–150 years.

The nemoral zone of northern Europe is characterized by deciduous broad-leaved trees. The principal species are pendunculate oak (*Quercus robur*) and beech (*Fagus sylvatica*), ash (*Fraxinus excelsior*), downy birch (*Betula pubescens*), silver birch (*B. pendula*), elms (*Ulmus*), small-leaved lime (*Tilia cordata*) and maple (*Acer*). Deciduous broad-leaved nemoral forests are the indigenous forest vegetation of Denmark and southernmost Sweden as well as edaphically favourable sites in southernmost Norway.

The standing volume of trees in the Nordic forests is almost entirely (> 98%) composed of native species and primarily indigenous boreal species (~97%). Three boreal tree species Norway spruce, Scots pine and Downy birch dominate the Nordic forests. The forests of Finland, Norway and Sweden are predominantly composed of these three tree species. Scots pine and Norway spruce are 41% and 40%, respectively, of the total standing volume in the Nordic countries, combined. Norway spruce is not only a dominant species in the boreal zone of Norway, Sweden and Finland, but also the most common tree species in Denmark even though it is introduced.

The current forest composition is however greatly influenced by different human–forest interactions. Over the centuries large areas of the native deciduous forests of Denmark and southernmost Scandinavia have been cleared for agriculture. During different periods of their history, all the Nordic coun-

tries have suffered from deforestation in different degrees. Therefore, much of the present forests are the result of human-induced regeneration and various silvicultural treatments. The species composition and structure of the present woods in all ecological zones is thus significantly different from the primeval forests of the region.

Table 3.2 Percentage area of natural forests (primary and modified natural), semi-natural forests and woodlands as well as plantations (production and protections combined).

	Denmark	Finland	Iceland	Norway	Sweden	Nordic
Natural	1%	7%	80%	24%	26%	19%
Semi-natural	50%	93%	0%	74%	72%	79%
Plantations	50%	0%	20%	2%	2%	2%

Source: FAO, country statistics 2005

Table 3.3 Percentage of total growing stock by native boreal, native nemora, introduced European, introduced non-European and unclassified species by country, and in total for the five Nordic countries.

	Denmark	Finland	Iceland	Norway	Sweden	Nordic
Native	32.7%	99.9%	53.2%	98.2%	99.0%	98.4%
Boreal	0.0%	99.7%	53.2%	97.2%	96.7%	96.6%
Nemoral	32.7%	0.2%	0.0%	0.9%	2.3%	1.8%
Introduced	58.5%	0.0%	41.4%	0.4%	0.0%	0.8%
European	43.0%	0.0%	20.4%	0.0%	0.0%	0.5%
Non-European	15.5%	0.0%	21.0%	0.4%	0.0%	0.2%
Unclassified	8.9%	0.1%	5.4%	1.5%	1.0%	0.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Analysis based on FAO, country statistics 2005

Table 3.4 Percentage of total growing stock by country of the three most common tree species in the Nordic countries (Scots pine, Norway spruce and Downy birch).

Tree species	Denmark	Finland	Iceland	Norway	Sweden	Nordic
<i>Pinus sylvestris</i>	5%	48%	0%	33%	40%	41%
<i>Picea abies</i>	31%	33%	6%	44%	43%	40%
<i>Betula pubescens</i>	no data	12%	53%	15%	9%	10%
Other	64%	7%	41%	9%	9%	9%
Total	100%	100%	100%	100%	100%	100%

Source: Analysis based on FAO, country statistics 2005

Norway, Sweden and Finland have 32 native tree species, each; Denmark has 30 but Iceland only three native species of trees. Due to their generally regular form, straight stems and ability to grow on relatively poor soils conifers have been the favoured trees of commercial forestry in North Europe. Therefore, introduced conifers have been an important component of Danish and Icelandic forestry.

Overall, introduced species account for only about 1% of the standing volume in the five Nordic countries (Table 3.3). Nevertheless, introduced species make up almost half the standing volume in Denmark, primarily Norway spruce (*Picea abies*), Sitka spruce (*P. sitchensis*) and a number of pine (*Pinus*) and fir (*Abies*) species as well as sycamore (*Acer pseudoplatanus*).

nus). Species for Christmas trees and greenery production adds up to 6% of the total forest cover. Introduced species are a minor component of Finnish forests. However, some stands of Siberian larch (*Larix sibirica*) as well as a number of other species are to be found in the country. In Sweden and Norway introduced species are also of minor occurrence, but considerable areas of lodgepole pine (*Pinus contorta*) have been planted at relatively high altitudes in Northern Sweden and Sitka spruce is about 0.4% of standing volume in Norway, primarily in coastal areas. Due to the young age of forest plantations in Iceland native birch woodlands account for almost the entire standing volume. However, native species constitute about 24% of seedlings planted annually. The remaining 76% of the seedling numbers are introduced species, mainly Siberian larch, lodgepole pine and Sitka spruce. Overall, in the Nordic countries lodgepole pine, Siberian larch and Sitka spruce are the most commonly planted non-Nordic conifers.

In the Nordic countries the total growing stock covers more than 6,400 million cubic meters (Table 3.5). This volume is almost entirely (99%) in the forests of Norway, Sweden and Finland and primarily in Sweden and Finland (84%). Overall, 78% of the growing stock is in commercial stands (Table 3.5).

Table 3.5 Total growing stock (million m³) in forests and woodlands and percentage of growing stock by countries and by commercial use (year 2005)

	Denmark	Finland	Iceland	Norway	Sweden	Nordic
Forest	113	2,158	0.5	863	3,155	6,253
Woodland	1,1	5	0.7	47	37	89
Total	114	2,163	1.2	910	3,191	6,342
% Nordic	1%	34%	0%	14%	50%	100%
% Commercial	76%	84%	32%	74%	76%	78%

Source: Analysis based on FAO, country statistics 2005

Iceland: about 84% of forests evaluated as commercial (objectives: production, social and multiple use), wood reserves in non-commercial natural birch woodlands .

3.2 Forest ownership

Forests are of immense importance for the Nordic societies. They provide a whole range of ecosystem services that contribute to the living environment and social welfare as well as to economic development. All national forest regimes in the Nordic countries aim at delivering multiple services where the essential trade-offs between different objectives are constantly addressed.

The forests of the Nordic countries are primarily privately owned; altogether around three fourths of the Nordic forests are in private tenure. Private forest tenure entails however a range of arrangements from individuals, organisations and private enterprises. Public forest land in the Nordic countries is under state or municipal tenure. Therefore, issues of sustainable forest governance have to be designed to fit the prevailing tenure regimes in the respective countries.

3.3 Concluding remarks

Forests are a prominent feature of the Nordic landscapes, especially in Norway, Sweden and Finland. In the less forested Denmark and much less forested Iceland, forests are, however of great value for a range of ecosystems services relative to the Selfoss Declaration. The Nordic forest ecosystems are dynamic and diverse and play a vital role for the challenges of climate change and water.



4. Nordic co-operation in the field of forestry



The Nordic countries and autonomous territories that are parties to the Selfoss Declaration on sustainable forestry actively co-operate in the field of forestry within the framework of Nordic co-operation, in Europe and globally. The Selfoss Declaration is a policy statement on Nordic forestry and the policy recommendations forwarded in this report are directed towards the already existing Nordic forest co-operation structures. To clarify who-is-who in Nordic forest co-operation present section portrays the current structure of forestry co-operation under the Nordic Council of Ministers.

4.1 Nordic co-operation

The Nordic countries Denmark, Finland, Iceland, Norway and Sweden as well as the autonomous territories Faroe Islands, Greenland and Åland have a long history of intimate co-operation at both formal and informal levels of government. Nordic co-operation is based on a deep sense of kinship among the Nordic people. A key event in the development of Nordic co-operation was the establishment in 1919 of the Nordic Society (Foreningen Norden) in Denmark, Norway and Sweden and by 1922 in Iceland and subsequently in

Finland. Since then the Nordic Society has been a driving force of closer co-operation in the Nordic region.

The institutionalized co-operation between the countries is within the framework of the Nordic Council and Nordic Council of Ministers. The Helsinki agreement, which came into force on 1st July 1962 is the foundation for the co-operation and has been revised several times to take account of new developments in the Nordic region.

The Nordic states provide funds for a common Nordic budget financing the Nordic Council, Nordic Council of Ministers, Nordic institutions and various projects.

The Nordic Council

The Nordic Council (Nordisk Råd) is a forum for co-operation between Nordic parliamentarians. It was formed in 1952 by, Denmark, Iceland, Norway and Sweden. In 1955 Finland joined the Nordic Council. The Nordic Council consists of 87 members who are elected by their respective parliaments. Parliamentarians from the autonomous areas of Greenland, the Faroe Islands and Åland participate as part of the Danish and Finnish delegations. The role of the Nordic Council is to make proposals on issues of Nordic concern and advise the Nordic ministers as well as to monitor the implementation of Nordic resolutions of co-operation. The Council holds an annual plenary session together with representatives of the Nordic governments to discuss topical issues of Nordic concern.

Nordic Council of Ministers

The Nordic Council of Ministers (Nordisk Ministerråd) is a forum for co-operation between the Nordic governments established in 1971 following a revision of the Helsinki agreement. The role of the Nordic Council of Ministers is to promote co-operation between the governments of the Nordic countries and the autonomous regions. The Nordic Council of Ministers financially support a number of projects, common Nordic institutions and programmes in areas such as research and innovation, culture and environment and where there are clear synergies to achieve common Nordic goals. In addition, the Nordic Council of Ministers facilitates co-operation with neighbouring countries, primarily the Baltic States, Northwest Russia and territories of the Arctic region.

The prime ministers of the Nordic countries have the overall responsibility for co-operation in the Council of Ministers. The daily management is delegated to the Minister for Nordic Co-operation (Ministeren för nordisk samarbete) appointed by each of the Nordic governments. The presidency of the Council of Ministers rotates annually among the Nordic countries.

Since January 2006 the Nordic ministers for different sectors of government have been organized in 10 ministerial councils of which the Council of

Ministers for Fisheries and Aquaculture, Agriculture, Food and Forestry (MR-FJLS) is one. A Committee of Senior Officials (CSO) consisting of civil servants from the member countries is attached to each council of ministers. They act as representatives of the council of ministers and prepare and follow up on the current business. The Committees of Senior Officials may meet several times yearly. The council of ministers or the respective committee of Senior Officials may appoint working groups for special issues.

The Nordic Council of Ministers has a Secretary General and the Secretariat is located in Copenhagen. The Secretariat administers the day-to-day operations of the Council.

4.2 Forestry and the Nordic Council of Ministers

Forestry is the concern of the Council of Ministers for Fisheries and Aquaculture, Agriculture, Food and Forestry (Nordisk Ministerråd for Fiskeri, Havbrug, Jordbrug, Levnedsmidler og Skovbrug MR-FJLS). The MR-FJLS covers four policy areas: 1) Fisheries and Aquaculture, 2) Agriculture, 3) Food and 4) Forestry. The ministers responsible for each subject area form four Committees of Senior Officials (CSO), respectively. Forestry is the responsibility of the ministerial CSO (Forestry).

Periodically, the MR-FJLS issues statements of emphasis for co-operation within the FJLS sector (handlingsplan). The key issues of the current statement (years 2009–2012) are: to 1) promote competitive utilization of biological resources, 2) improve the adaptability of the Nordic countries to climate change and related challenges, 3) safeguard genetic diversity for future generations, 4) support rural development and coastal communities including the local cultural heritage, 5) further develop the Nordic welfare model, with emphasis on good public health and animal welfare and protection.

The Committee of Senior Officials for forestry (CSO-Forestry) promotes sustainable forestry in the Nordic region through research, development and training, particularly through research and networks within the Nordic Forest Research Co-operation Committee (SNS).

The issues of the Selfoss-declaration also impinge on subjects addressed by the environmental co-operation within the Nordic Council of Ministers. Within the Nordic Council of Ministers, environmental issues are structured into The Nordic Council for Environmental Affairs (MR-M) and its Nordic Committee of Senior Officials for Environmental Affairs (ÄK-M). Issues of climate change including adaptation to altered conditions, water supply and quality, biodiversity and environmental services of ecosystems, recreation, and sustainable means of environmental management are all issues under the Nordic Council of Ministers for the Environment.

Nordic Forest Research Co-operation Committee (SNS)

SamNordisk Skogforskning (SNS) is an organisation of co-operation in the field of forestry established in 1972. The SNS is financed by the Nordic Council of Ministers and continuously evaluated by the Nordic Committee of Senior Officials for Forestry (CSO-Forestry).

SNS is directed by an executive committee meeting twice a year with two members from each of the countries Denmark, Finland, Iceland, Norway and Sweden and one observer each from the independent territories of Åland, the Faroe Islands and Greenland. Members represent research institutes, research funding bodies, forest administration agencies and forest owners, and industrial interests. On a four-year cycle the secretariat and chairmanship of SNS rotates among the five countries.

The mission of the SNS is to promote research into sustainable forestry with different objectives, as well as to advise the Nordic Council of Ministers on questions concerning forests and forestry research. The guiding principle of SNS is to support the socially, economically and ecologically responsible management and utilization of forests and timber resources in the Nordic region. The scope of the SNS covers forestry, forests and other wooded areas (wooded landscapes, parks, urban trees and marginal land), the utilization of wood and other forest products, as well as the non-commercial value of the forests.

The objectives are specifically:

- to create Nordic synergy within forestry research by granting support to networks, research meetings, projects, joint utilisation of unique research facilities,
- to promote the development of new research areas through initiating networks and task forces
- to promote research co-operation with the Adjacent areas (mainly the Baltic countries and Northwest Russia)
- to strengthen the role of Nordic forestry research in European collaboration and encourage Nordic forest researchers to take part in international projects
- to work to ensure that research results are communicated to the relevant parties within the Nordic co-operation framework
- The SNS allocates research grants to projects and networks as well as supporting two forest-related journals (*Scandinavian Journal of Forest Research* and *Wood Material Science and Engineering*).

Grant support by SNS

The SNS financially supports research related to forestry, forests and other wooded areas and the utilisation of wood and other forest products, as well as the non-commercial values of the forests. The SNS grants are about 0.5 % of the total amount of forest research money in the Nordic countries. SNS grants are glue money – they are for new initiatives and catalyser money.

The essence of SNS grants is to create “Nordic synergy”. Therefore, research collaboration should lead to an added value, compared to unilateral research. In its work SNS has identified target subject areas to be prioritized. Grant support is only provided for research collaboration involving at least three Nordic countries. Co-operative projects involving a number of Nordic countries and the adjacent areas Estonia, Latvia, Lithuania and north-western Russia are welcomed.

The SNS will give financial support for five types of research collaboration: 1) Research projects, 2) Preparatory studies for larger projects (pilot projects), 3) Networking activities, 4) Preparation of applications to the EU framework programme, 5) Centres of Advanced Research (CAR). More information about SNS grants may be obtained from: <http://www.nordiskskogforskning.org/sns/en/applications/>

During 2010–2013 priority will be given to the following research areas:

- Climate change, including adaptation and mitigation possibilities in forests. The role of forests and forest soil in the carbon balance.
- Measures for increased biomass production for substitution of fossil and other non-renewable nature resources.
- Wood material improvement and methods for increased and new use of wood products
- Use of forests and forest land in a way that conserves and restores biological biodiversity and avoids negative effects on land and water, for instance erosion damage.
- Forest damages and health of forests – prevention and restoration measurements
- The economic, social and cultural importance of forest in society. The possibilities of forests to contribute to coastal and countryside development through use of ecosystem services.

Permanent Research networks

A number of research network groups with different fields of speciality are connected to SNS. Each group organizes conferences, workshops and post-graduate courses, and as well initiates research projects. Some of the networks are CAR networks. SNS has permanent network groups for e.g.: Wood Science and Engineering, Forestry Economics, Communication, and Forest Regeneration.

Centre of Advanced Research (CAR)

A CAR is a joint Nordic forest research programme within a specified scope (field/area) and of a maximum five year duration, after which it will be evaluated. Subsequent funding is dependent on successful evaluation. Each CAR must have at least 67 % national co-financing. For participants from The Baltic

countries and the Adjacent Area a certain national financing or other relevant support is required. It is expected that a CAR will operate a home-page.

More specifically CAR is a network, 1) approved by SNS, 2) with a specified core theme in terms of scientific subject matter and leadership, 3) in which research is carried out in a decentralised manner as agreed on in regular planning processes by the CAR partners themselves and 4) is funded by the participants. Each CAR must address the question of integrating existing networks of SNS in the area and a CAR should be open to other Nordic research in the area as well as in the Baltic Area and Adjacent Regions of Nordic co-operation.

The aim of a CAR is to obtain synergies and avoid overlapping research.

In 2005–2010 SNS has supported five centres of advanced research (CAR) of importance for the Selfoss Declaration:

- Forest Genetics and Tree Breeding, GENE CAR
- Operation Systems OSCAR
- CAR-ES: Centre of Advanced Research on Environmental Services
- CARE-FOR-US: Centre of Advanced Research on Forestry Serving Urbanised Societies
- Forest Pathology, PATHCAR.

Journals

SNS is the scientific backing for two forestry journals. The *Scandinavian Journal of Forest Research* which publishes original articles relevant to forests and forestry of boreal and temperate regions. In addition to original articles and research contributed by international academics and professionals from within the forest industry, the journal presents a popular News & Views section covering topical issues and items concerning R&D in the forest industry sector. <http://www.tandf.co.uk/journals/titles/02827581.asp>

SNS provides the scientific backing for the journal *Wood Material Science and Engineering* that aims to serve at the forefront of the wood science and technology field. <http://www.tandf.co.uk/journals/swoo>

The Nordic Genetic Resource Centre (NordGen)

NordGen (Nordiskt Genresurscenter) is a Nordic organisation dedicated to the safeguarding and sustainable use of plants, farm animals and forests. NordGen was established in January 2008 as a result of a merger between the Nordic Gene Bank, the Nordic Gene Bank Farm Animals and the Nordic Council for Forest Reproductive Material. NordGen is mainly financed by the Nordic Council of Ministers and is directed by a board of representatives from Denmark, Finland, Iceland, Norway and Sweden. Its three sectors are organised into three departments: Plants, Farm Animals, and Forest. The

main office and NordGen Plants are located at Alnarp, in southern Sweden. NordGen Farm Animals and NordGen Forest are located at Ås, Norway.

NordGen's primary task is to contribute to securing the broad diversity of genetic resources linked to food and agriculture. This is done through activities related to conservation and sustainable use, solid documentation and information work, and international agreements. NordGen co-operates with the national programmes for the management of genetic resources in agriculture in the Nordic countries and with the research sectors at various universities and research centres.

NordGen Forest

NordGen Forest is the forestry division of the Nordic Genetic Resource Centre. It is the smallest unit of NordGen with only one 50 percent position and three part-time employees. It serves as a Nordic forum in the fields of forest genetics and genetic resources, supply of seeds and plants, and methods for regeneration. The main goal is to contribute to the establishment of the best possible Nordic forests for the future by organising thematic days, conferences, seminars and meetings. NordGen Forest monitors and initiates research and development, and disseminates information. NordGen Forest contains two external bodies, the Council and the Working Group on Genetic Resources, each with members from all Nordic countries.

The Council seeks to increase the availability of suitable forest reproductive material and to promote successful forest regeneration in the Nordic countries. This includes both practical and administrative parts of seed and plant supply, regeneration methods, genetics and tree breeding. Its members exchange information on regeneration issues, discuss different topics of interest to Nordic forestry, and plan coming events.

The Working Group on Genetic Resources ensures co-operation in conservation and use of genetic resources of forest trees among the Nordic countries. It forms an interface between conservation activities at the national and the European levels (EUFORGEN), and initiates and implements activities that can improve or guide the conservation and use of forest genetic resources.

Every year NordGen Forest hosts thematic days and a conference as well as seminars and meetings. NordGen Forest thematic days are held twice a year. Current topics are presented and discussed with the help of invited speakers. NordGen Forest conferences are held annually. Hosting of the event rotates among the Nordic countries. Through presentations, discussions and excursions the conference helps to increase the general level of competence in the field of forest regeneration. Information and news related to the forestry activities are presented on the web page of NordGen and in publications.

The Baltic Sea Collaboration

The Nordic Council of Ministers has been seeking greater co-operation with the neighbouring states in the Baltic region. Additionally, the Council of the

European Union endorsed the EU strategy for the Baltic Sea Region (EUSBSR) on 26 October 2006 and this has been confirmed by the European Council (Heads of State and Governments). The strategy is thereby an integral part of the Community policy.

The Baltic Sea Strategy lays the foundation for collaboration among the various actors in the region, taking advantage of the existing processes and networks such as HELCOM and the Nordic Council. The strategy provides the framework for joint projects to seek funding from various sources and to focus actions on the key areas.

European Forest Institute

The European Forest Institute (EFI) was established in 1993 to provide a forest research and information resource to meet the needs of a rapidly changing Europe. Originally, EFI was a Finnish association located in Joensuu. As part of a wider strategy to improve the contribution of EFI to international forest research, the Institute was established as an international organisation with the signing of the Convention in Joensuu, Finland on 28th August 2003.

With the founding of EFI a common European organisation dedicated to forest research was provided. By the summer of 2009, a total of 21 European States had ratified the Convention on EFI. EFI has currently 126 member organisations from 37 countries. They represent forest research, industry, forest owners, environmental research and international forest-related organisations.

Financial resources are provided through membership fees, voluntary contributions and any other sources that may present themselves.

The Institute undertakes research at the pan-European level on forest policy, including its environmental aspects, on the ecology, multiple use, resources and health of forests and also on the supply and demand for timber and other forest products and services. This contributes towards promoting the conservation and sustainable management of forests in Europe.

EFI is recently organising Regional Offices, three of which are already operational. The Regional Offices of EFI are integral parts of the Institute and governed by Terms of Reference and EFI management practices. They address forest research and networking issues at a regional level, following the EFI Strategy.

EFINORD

In 2009 the Annual General Meeting of the European Forest Institute (EFI) in Dublin, Ireland, accepted the application for a Regional Office in North Europe the Inauguration of European Forest Institute's North European Regional Office – EFINORD will be held in Copenhagen, Denmark on 17 November 2010..

At the onset, 18 participating research institutions from 11 countries will form EFINORD. EFINORD, will focus geographically on the Nordic coun-

tries, as well as the Baltic Sea region, including Russia, Estonia, Latvia and Poland and also extending across the North Sea to include Ireland and Wales.

Under the heading “Sustainable Forestry” EFINORD will create networks and frameworks for research related to the Selfoss Declaration such as in biomass production, bioenergy, biodiversity, clean water, forest as a resource, and impacts of climate change.

EFINORD is a new flagship project under the EU Strategy for the Baltic Sea Region priority area nine (forestry).

4.3 Concluding remarks

Nordic forest co-operation is well established and functional. It is represented by two formal institutions, NordGen Forest and SNS, which have the infrastructure to facilitate the implementation of the commitments of the Selfoss Declaration, if given the resources needed. The initiative to establish formal collaboration with EFI and the establishment of EFI NORD as a joint venture with SNS is a further indicator of the vitality and strength of the Nordic forest co-operation movement.



5. Forests and water



This section addresses one of the two key topics of the Selfoss Declaration, the link between forests and the freshwater resources. An overview of the Nordic freshwater resources is presented together with policies and research in relation to forests and water.

5.1 Freshwater resources

Freshwater resources vary greatly between the Nordic countries (Table 1). Iceland and Norway have very substantial freshwater resources, both in total volume and per capita. Denmark, on the other hand, has very restricted freshwater resources, while Sweden and Finland are comparably well endowed with freshwater resources with equal volume per capita. Even though the total quantity and average quality of freshwater resources are high in Iceland and Norway, water supply can be locally critical.

Table 5.1: Total freshwater resources (million m³), percent of Nordic total freshwater resources, freshwater per capita (m³ per capita for population in 2006) and percent of Nordic weighted average freshwater per capita of the five Nordic countries; Denmark, Finland, Iceland, Norway and Sweden, as well as the Nordic total.

Country	Population	Total freshwater resources		Freshwater per capita	
	Persons (year 2006)	Volume in million m ³	% of Nordic total	Volume in m ³ capita ⁻¹	% of Nordic average
Denmark	5,427,459	16,340	1.9%	3,011	9%
Finland	5,255,580	110,000	12.7%	20,930	59%
Iceland	299,891	170,000	19.6%	566,873	1,600%
Norway	4,640,219	389,442	44.8%	83,928	238%
Sweden	9,047,752	183,360	21.1%	20,266	57%
Nordic total	24,670,901	869,42	100%	35,229	

Data for Finland includes the Åland Islands.

Source: Eurostat (<http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>)

5.2 Freshwater ecosystems

Climatic and geological conditions in the Nordic countries favour the formation of lakes and rivers. Lakes and rivers offer diverse habitats and many aquatic plant and animal species are particularly adapted to live in certain types of rivers or lake beds, at definite depths or in particular light conditions. The cold winters and ice are special features of Nordic lakes and rivers that impinge on aquatic life that may be drastically affected by climate change.

More than 370,000 lakes larger than 1 ha are to be found within the Nordic countries, most of which are less than 100 hectares in size, but more than nine thousand lakes are larger than 100 hectares (Table 2). In fact, about two thirds of all lakes and almost all the large lakes in Europe are found in Northern Europe, with most in the five Nordic countries.² As an example, in southern and central Norway, Sweden and Finland lakes cover 10–30% of the land surface.

Sweden, Finland and Iceland have about 70% of the total land area of the five Nordic countries and 4,021 rivers more than 10 kilometres in length. Hence, the total number of large rivers in the Nordic countries is probably between five and six thousand. In addition there is high number of lesser rivers and streams that are important to aquatic biodiversity. The riparian area, i.e. the ecotone where land and water meet and interact, is usually very species rich. The ecosystem in small streams depends to a large extent on the vegetative cover adjacent to the stream. Input from foliage litter and arthropods falling into the streams are a vital driving mechanism for the riparian ecosystem. Hence, the Nordic countries have large and ecologically important freshwater ecosystems.

² Lakes and rivers, pages 243–254 in: Eeva-Liisa Hallanaro and Marja Pylvänäinen. Nature in Northern Europe. Nordic Council of Ministers. Nord 2001:13. 350 pages.

Table 5.2: Lake numbers and sizes within the five Nordic countries; Denmark, Finland, Iceland, Norway and Sweden.

Country	Small lakes (1–100 ha)			Large lakes (>100 ha)		
	Number	Percent of Nordic total	Density Lakes pr. km ²	Number	Percent of Nordic total	Density Lakes pr. km ²
Denmark	2,762	0.8%	6.3	80	0.9%	0.18
Finland	53,423	14.7%	15.7	2,609	28.2%	0.77
Iceland	8,650	2.4%	8.4	193	2.1%	0.19
Norway	208,000	57.0%	64.2	2 457	26.6%	0.76
Sweden	91,817	25.1%	20.4	3 904	42.2%	0.87
Nordic total	364,652	100%	28.9	9 243	100%	0.73

Source: Table 137 in: Eeva-Liisa Hallanaro and Marja Pylvänäinen. *Nature in Northern Europe*. Nordic Council of Ministers. Nord 2001:13. 350 pages.

Lakes and rivers may be classified according to their nutrient status and their consequent productivity as ultra-oligotrophic (extremely nutrient-poor), oligotrophic (nutrient-poor), mesotrophic (intermediate nutrient levels), eutrophic (nutrient-rich) and hypertrophic (excessively nutrient-rich). Lakes with brown water, rich in humus, that are common in boggy areas, particularly in the central part of Norway, Sweden and Finland, are termed dystrophic.

The impact of land use, such as forestry operations, on these aquatic ecosystems largely relates to these natural circumstances as well as the intensity of forest management and the manner in which forestry is conducted. It may influence aquatic ecosystems in many ways, but primarily by affecting the quantity and quality of water entering streams and lakes. In the Nordic countries three issues are most important for water quality: aquatic productivity and biodiversity; sedimentation and eutrophication; and acidification of lakes and streams.

In general, biological productivity and species diversity increase with higher nutrient levels of natural aquatic systems up to the eutrophic level. Beyond that level, species diversity and ecosystem complexity may decline with increasing nutrient levels. In eutrophic lakes the large quantities of microscopic organisms make the water turbid, reducing light penetration to deeper levels. Hypertrophic lakes often have a narrower range of planktonic species than less productive lakes and may, due to decomposition of excessive plankton biomass, suffer from oxygen depletion in deeper layers during summer. This condition may even become more widespread in winter when ice covers the lake. This will result in the death of fish and other aquatic animals and fundamentally change the microbial processes within the lake to an anoxic system. At a less extreme level, eutrophication affects the composition of the ecosystem.

Water and forest management

Intensive harvesting practices, soil scarification or removal of ground vegetation might increase leaching of nutrients from the site to water bodies. Fertilization, application of organic waste, wood ash from biomass com-

bustion, and prescribed burning of logging residues may also affect nutrient leaching and possibly also introduce heavy metals and other pollutants into the system. Wood ash primarily entails the risk of heavy metal contamination. Removal of slash (branches and tree tops) might on the other hand reduce long-term nutrient fluxes to aquatic systems but possibly at the cost of lower long-term forest productivity. In areas with steep slopes and high precipitation, such as western Norway, increased harvesting on slopes could lead to increased erosion and high sediment loads in streams affecting water quality and reproduction of fish. The impact of a given forestry operation scenario may vary geographically, depending on, for example, soil type as well as on operational details, such as proximity to streams and lakes. There is thus no simple and single answer to questions of how intensification of forestry practice, such as greater biomass removal, site scarification, fertilization or wood ash application, on water quality and aquatic systems. The relationships between forestry operations and aquatic ecosystems are not always simple. In many aquatic systems, especially in small streams, food sources from the land are also necessary for their function. Because of this, and due to all the chemical processes in the water as it enters discharge areas, the immediate water's edge of the forest may be more important for water quality than the forest in general at some distance from the water body. Hence, effective buffer zones may in some cases be more important than the forest operation per se.

The ancient igneous and metamorphic bedrocks that cover most of Norway, Sweden and Finland are highly resistant to chemical weathering. The freely drained soils in this area are usually podsollic with highly leached surface horizons that have generally low buffering abilities to acidic precipitation, and the mires are generally quite acidic. These conditions generally coincide with the bulk of the boreal forests of Norway, Sweden and Finland. The southwest of the Scandinavia Peninsula has been seriously affected by acidification of lakes and streams due to sulphur and nitrogen deposition. Deposition of air pollutants is high (but has drastically decreased during the last 20 years in the case of sulphur) in this area and surface water is often unable to resist acidification as the soils tend to have low buffering capacity. Acidic deposition is generally a minor problem in other parts of Norway, Sweden and Finland. Iceland and the northern and eastern parts of Denmark are virtually unaffected by acidification due to the mineralogy of the parent soil material.

The differences between countries and regions of the Nordic countries must be considered when addressing forestry practice and water issues. However, the unlike conditions are also important for the Nordic synergies that are central to Nordic co-operation. These synergies are particularly important for an environment in change.

5.3 Policies on water and forests

All the Nordic countries have policies, legal structures and water authorities to ensure quality and quantity of water for human consumption and utilization of water resources. Also, legislation and monitoring institutions exist to protect freshwater ecosystems and control their use. Much of this is outside the realm of forestry per se. However, Denmark has an active policy to afford important water extraction areas.

The Nordic countries are all signatories to the declarations of the Ministerial Conference on the Protection of Forests in Europe concerned with water and forestry.

The Nordic countries of more restricted water supply, Denmark, Finland and Sweden, are all members of the European Union (EU). The recent EU Water Framework Directive implies the need for increased knowledge of the impact on water quality of various forestry measures. In the 2008 Swedish forest bill (A forest policy in line with the times) the Swedish Forest Agency (Skogsstyrelsen) was given the assignment to analyse what consequences the EU Water Framework Directive will have on Swedish forestry and how the forestry can contribute to the implementation of the Water Framework Directive. It also includes an analysis on the need for measures and changes in regulations. In December 2009 the river basin district authorities adopted management plans, programmes and environmental standards. Although not EU countries, Iceland and Norway will implement the EU Water Framework Directive through the EES agreements.

The EU Water Framework Directive does not directly address issues of climate change, but measures involving efficiency of water use affect adaptation to more constrained water as a result of climate change.³ In Denmark, availability of freshwater is foreseen to become more constrained, as shown by the concluding statement on water supply in the Danish strategy for adaptation to a changing climate issued by the Danish Government in March 2008:

“Lack of groundwater, especially for supplying the large cities in the summer half-year, may in the long term (after 2030) necessitate reassessment of the socio-economic consequences of the Water Framework Directive. Furthermore, there may be a need to amend the regulations for irrigation with respect to nature’s need for water.”⁴

5.4 Implementation and legal framework

All the Nordic countries have laws and regulation for the protection and monitoring of freshwater resources as well as for the protection of aquatic species and ecosystems.

³ Page 33: Regjeringen Stoltenberg II. St.meld. nr. 39 (2008–2009). Klimautfordringene – landbruket en del av løsningen. Tilråding fra Landbruks- og matdepartementet av 29. mai 2009, godkjent i statsråd samme dag. Det Kongelige Landbruks- og Matdepartement. Oslo. 177 pages.

⁴ Page 24: Danish strategy for adaptation to a changing climate. The Danish Government, March 2008. Danish Energy Agency, Copenhagen, 52 pages.

The forestry legislation and National Forest Programmes in Sweden and Finland directly address protection of freshwater resources and aquatic ecosystems. In Sweden the Forest Agency (Skogsstyrelsen) monitors selected forestry operations and advises on forestry in order to improve respect for the water in the forest landscape.

However, the forestry legislation and forest monitoring mechanisms vary considerably between the Nordic countries. In Iceland protection and use of water resources and protection of the natural environment are mostly covered in special laws with no relevant provisions for forestry per se. Similarly, in Denmark the protection and use of water resources is primarily controlled by legislation other than the forest act. This difference in legislation reflects a general difference between the countries on forestry issues. In Norway and Sweden forestry legislation is generally prescriptive and the state has some means of intervening in silvicultural practice. In Iceland, forestry legislation is generally liberal in the sense that the means by which forests are established or managed are generally outside official control. Even so, deforestation and clear cutting are categorically banned and continuous cover silviculture prescribed. As part of the general planning legislation, forestry practice in Denmark is relatively liberal but constrained by both forest legislation, and for the protection of watercourses and groundwater, primarily by other legislation. Afforestation is constrained in river valleys and long streams but is promoted in areas with significant freshwater resources.

5.5 Research

In Sweden, Finland, Norway and Denmark there are quite a few research efforts into the relationships between forestry operations and soil water quality. The focus of much of the research is on intensive forest management, in particular intensive removal of biomass and site nutrient compensation by fertilization and application of wood ash from bioenergy installations. The emphasis is mainly on soil water nutrient levels, acidification, heavy metals, organic pollutants, and leaching of nutrients from the site.

In most cases the relationships with aquatic ecosystems and runoff water qualities are only indirect in studies of forest operations. Nevertheless, some studies have addressed these issues in different Nordic countries. For example, the effect of final felling of forest stands on runoff water chemistry and discharge has been widely studied, as has the effect of wooded strips along streams (buffer zones) on runoff water chemistry and aquatic organisms in northern Sweden. In Finland the role of forest land in artificial recharge of high quality groundwater resources to compensate for water extraction has also been studied. In Iceland, a national project “ForStreams” was recently launched on the effects of afforestation and revegetation of treeless watersheds on water chemistry and aquatic ecosystems. In Den-

mark, a number of studies have focused on issues of nutrient leaching from intensively managed plantations for Christmas trees and decorative foliage.

The SNS-supported Centre of Advanced Research – Environmental services (CAR-ES) is a virtual centre for strengthening forestry research and development (R&D) in the Nordic and Baltic countries, focusing on the impacts of forest management on environmental services, water protection, carbon sequestration and biodiversity. The CAR-ES has participants from all the Nordic countries. The Nordic project funded by SNS (2006–2008), “*Environmental effects of shorter forest rotation in a landscape perspective*”, also addressed effects of climate change and forest management on water protection issues, carbon sequestration and biodiversity.

Because of the large variation in physical factors that greatly affect how forestry practices influence water chemistry and aquatic life, such large-scale Nordic projects are of high importance and can lead to new knowledge on how forests and water interact. Such co-operation should be further strengthened in the future.

5.6 Concluding remarks

The Nordic countries are differently endowed with freshwater resources. Denmark has only around 3 million m³ per capita, compared to Iceland’s 566 million. Sustainable freshwater management is a highly relevant issue in all Nordic countries and a political priority. All the Nordic countries have recently or are in the process of updating their policies relative to freshwater resources, through implementation of the EU Water Framework Directive.

A common concern is how to integrate freshwater management into forest policies and vice versa. The ad hoc group also notes that FOREST EUROPE (formerly MCPFE) is actively working on policies on the interconnections between water and forests, a process that is important for the Nordic countries to follow and to provide input.

The ad hoc group wants to highlight the current (2008) SNS publication, a fact sheet from the Centre of Advanced Research on Environmental Services (CAR-ES): “Forests provide clean water”, as a good example of Nordic contribution to advance policies in this important field.

6. Forests and climate change – mitigation



The connection between forests and climate change has two principal dimensions, mitigation and adaptation. Mitigation concerns the role forests and forestry can play in reducing the effects of climate change by capture of CO₂ from the atmosphere and the subsequent storage of carbon in soil, forest biomass and harvested wood products or substitution of fossil fuels. It also entails reduced emissions of greenhouse gases from deforestation or forest operations.

The Selfoss Declaration emphasises mitigation by sustainable forest management to provide: multiple values to society; high economic yield while maintaining biodiversity; and enhancing ecological values. In this section, the focus is on the mitigating linkages between forests and climate change, highlighting the key elements of relevance for Nordic forestry.

6.1 Forests and carbon emissions

Globally, deforestation contributes significantly to rising concentrations of greenhouse gases in the atmosphere. In the Nordic countries forests are generally increasing in area and biomass and in all the Nordic countries are net sinks of carbon from the atmosphere. Therefore, combating deforestation is an important aspect of many Nordic countries' foreign policies, but of minor concern within the Nordic countries.

In the Nordic countries and globally, forest operations are minor sources of greenhouse gas emissions. The Nordic countries, especially Sweden and Finland, are among the leading countries worldwide in the development of forest operations technology and manufacture of forest machinery. Improved efficiency, introduction of low carbon energy for forest machinery, and low environmental impact are ongoing objectives for Nordic forest technology.

6.2 Carbon sequestration

Carbon sequestration involves the capture of carbon dioxide gas from the atmosphere and its temporary storage in forest biomass as well as in soil organic matter or wood products. Sequestration of atmospheric carbon into forest ecosystems has a high potential for mitigation of climate change and might at the same time become a win-win scenario in relation to other environmental and social issues.

However, it should be noted that increased storage of carbon in forests may reduce possibilities for increased storage in harvested wood products and the production of forest bioenergy that can replace fossil fuels.

Carbon sequestration in forests can be promoted by: 1) enhancing carbon storage in the wood product chain, 2) increasing the potential for CO₂ capture and storage per unit land area and by 3) expanding the forest area for increased sequestration, i.e. by afforestation.

Carbon in the wood product chain

Following harvesting, carbon stored in the harvested biomass may be released to the atmosphere with widely different delay times, depending on the end-use commodity. Carbon in biomass used for combustion is released to the atmosphere with only a short delay while carbon in wood used for manufacture of durable wood products might remain in store for a very long time. In the case of structural timbers in buildings carbon might be stored for centuries. However, altogether the total carbon storage in wood products is relatively small compared to forest and soil carbon storage. For a number of end-uses wood can replace materials that involve net greenhouse gas emissions such as concrete or steel. In that case, use of wood products also involves reduced emissions.

Unit area carbon uptake

Increased site productivity involves intensification of forest management. For a very long time and especially since the middle of the 20th century, forest management in the Nordic countries has been intensified. As a result forest yield has risen progressively. Unit area carbon sequestration can be elevated by promoting higher forest growth rates through fertilization,

including wood ash application, or by site improvement treatments such as scarification, as well as by using more productive genetic material, e.g. through tree breeding. During the latter half of the 20th century the area of productive forest in Norway, Sweden and Finland increased partly due to draining of about 7.6 million ha of peatland for productive forestry. In Finland 55% of the total peatland area has been drained for forestry while about 14% of initial peatland has been drained and afforested in Sweden and Norway. By now, conversion of peatland to productive forests has largely stopped. The net effect of draining of peatlands on net greenhouse gas emissions is a complex issue that is currently being studied but there is a need for considerably more research effort in order to clarify the subject.

The rate of carbon sequestration in managed forests is also affected by the rotation lengths. In the long term, unmanaged natural forests free from disturbance for extended time spans are usually close to carbon saturation. Generally, these forests have relatively high carbon stocks but usually very low actual / present sequestration rates. By adjusting the rotation length in managed forests carbon sequestration rates can be maintained at a high level, but at the expense of standing carbon stock. However, as the harvested carbon can be used for durable wood products the combined storage time in the forest biomass and wood product chain might compensate for the reduced forest biomass carbon stocks. The harvested biomass might alternatively replace carbon from fossil fuels and thereby reduce the climate impact of, for example, energy generation.

Afforestation

During the 20th century the forest cover has increased in all the Nordic countries. The potential for further afforestation varies considerably between the five Nordic countries. The forest area of boreal Finland, Sweden and Norway is currently close to a saturation level. The potential for afforestation in the boreal zone of Finland, Sweden and Norway is small and mostly in coastal and Northern Norway. The potential area for afforestation in coastal West and North Norway has been estimated as 0.5 million ha. Between 1950 and 2000 about 260,000 ha were afforested in that region and most of the forest is by now highly productive and is expected to contribute significantly to the wood supply⁵. The Norwegian Ministry of Agriculture and Food has proposed an afforestation effort of 100,000 ha in coastal West and North Norway during a period of 20 years (5,000 ha per annum). That initiative might result in a CO₂ sequestration rate of 2.2 million tonnes during a 50 year period. The project would be sensitive to issues of cultural landscapes, cultural heritage and biodiversity and partly rely on natural regeneration.

Since the oil crisis of the 1970s some agricultural land in Sweden has been used for short rotation willow crops for energy production, and to a lesser degree in other Nordic countries. In Sweden, about 16,000 ha of short

⁵ Kystskogbruken (2008)...

rotation energy willow had been established, which is about 0.5% of the arable land area (2.7 million ha). The potential by 2020 for establishment of high yielding tree crops for energy production has been suggested as 10–25% of the arable land area, assuming that the conversion ratio for the whole of Norway, Sweden and Finland would indicate an area of about 0.5–1.5 million ha. In Denmark, a new policy for agriculture (Grøn Vækst) promotes short rotation willow for energy production.

Since the early 19th century the forest cover of Denmark has increased from about 2–3 % to the present level of 14% (13% high forests) of the land area and primarily by afforestation. Continued afforestation is a key element in the current forest policy, with a target value of about 20–25% forest cover within the present century. Nevertheless, afforestation is severely constrained by competition for land with other land uses, especially agriculture.

Currently, Iceland has the lowest forest cover of the Nordic countries but has considerable potential for forest expansion, both on open moorland and degraded volcanic wastelands.

Restoration of degraded sites by afforestation

Globally, desertification is a major economic, social and environmental problem of concern in different regions of the world. A Plan of Action to Combat Desertification (PACD) was adopted in 1977 by the United Nations Conference on Desertification (UNCOD). In 1992, the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro called on the United Nations General Assembly to establish an Intergovernmental Negotiating Committee (INCD) to prepare, by June 1994, a Convention to Combat Desertification, particularly in Africa. The Convention was adopted in Paris on 17 June 1994 and entered into force on 26th December 1996. With the Selfoss Declaration desertification and restoration of forests on wastelands within the Nordic countries was brought to bear within the scope of Nordic co-operation.

Paragraph eight of the Selfoss Declaration states:

(8) *support* the idea that forests which aim, for example, to protect against erosion or preserve biological diversity or are planted to rehabilitate eroded fields, should also be capable of being used for timber production, as long as this contributes to looking after the forests' ecological, social and economic values

The appendix to the Selfoss Declaration further elaborates on the restoration issue and makes reference to the “Hekla’s forest” restoration project:

Protection from erosion – “Hekla’s forests”

The forest binds soil and thereby prevents deflation and soil erosion. In parts of the world with a deforestation problem, there are now large eroded areas without vegetation. This creates environmental problems for these countries and their inhabitants and it is therefore important to increase afforestation in order to protect fields and combat erosion. Such problems also occur in the Nordic Region of today, including in Iceland.

In Iceland, land degradation and desertification is a major issue. Below the thermal tree limit there are about 1.8 million hectares of treeless moorland and 1.3 million hectares of volcanic deserts, excluding the lava fields. Most of the volcanic wastelands were initially formed by interaction of deforestation, volcanism and the stormy climate. Trees survive heavy deposition of volcanic tephra, bind together and shelter the soil from the wind as well as moderate frost heave. The volcanic soil (andosol) has inherently low cohesion and is vulnerable to erosion by wind and water. Prior to the human settlement of Iceland in the late ninth century, even big volcanic eruptions prompted only moderate soil erosion and then primarily in the highlands where tree or shrub cover was limited. Following the settlement, most of the forest and scrub cover was cleared, primarily to produce pasture for the livestock and for heat during the centuries of increasing cold. As a result the soil was predisposed to erosion. The most catastrophic were initiated by explosive volcanism.

Prior to human settlement the landscape around Mt Hekla, one of Iceland's most active volcanoes, was well wooded, including the slopes of the volcano. Following deforestation of the area a heavy downpour of volcanic tephra initiated a catastrophic erosion cycle. Tephra has low bulk density and is easily blown by the wind. In areas of thick layers of tephra the wind picked up the particles, forming dunes that crept over the landscape, killing the ground vegetation as they moved. As the dunes moved on, the wind eroded the soil profile to the bedrock or the stony subsoil. The landscape around Mt Hekla had deep and fertile soil and a vast region of good agricultural land was laid waste by the tephra encroachment.

In 2006 the "Hekla's forests" project was launched with the aim of afforesting 62,000 ha of volcanic wastelands around Mt Hekla. The basic objectives are restoration of productive forest ecosystems on barren wastelands and an insurance policy against land devastation by big explosive volcanic eruptions. The afforestation project has multiple ecological, environmental, biodiversity and social benefits, as well as creating a potential future wood resource.

Continuous tree cover is important for the stability of andosols. Due to its fine texture and low cohesion the soil is very prone to soil creep and landslides on sloping ground. Also, the physical properties promote frost heave during frost thaw cycles that may result in patch erosion. Forest cover to a large degree stabilizes these erosion processes. In recognition of these phenomena, clear cutting is categorically banned in Iceland's forest legislation. Thinning and continuous cover silviculture by small felling coupes is the only regeneration method allowed.

The erosion-tree cover interactions are quite complex and variable. In the vicinity of the glaciers extensive glacial outwash planes have been formed by catastrophic glacial floods. These floods are the result of sub-glacial volcanic eruptions or sudden draining of sub-glacial lakes formed by geothermal activity or lakes formed by glaciers damming valleys. Given that a forest cannot withstand the strongest currents of these floods it is fortunate

that most of the inundated area has only moderate to low currents. The presently extensive size of the flood planes is probably an interaction of deforestation and glacial advance until the end of the 19th century. Presently, birch is spontaneously establishing woodland on the extensive glacial outwash planes south of the Vatnajökull Glacier. Also, afforestation trials have been quite successful on the outwash plains. In fact, forests might be important erosion control as well as a productive land use of these outwash plains.

Although, restoration of degraded sites by afforestation is presently a most pressing issue in Iceland, similar problems have arisen in other Nordic countries. In the latter half of the 19th century and during the 20th century the Danish Heath Society afforested extensive areas of degraded sites in Jutland and curbed soil erosion and drift sand in that area. In fact, the Heath Society was the blueprint for the early afforestation and erosion control measures in Iceland. In Norway, Sweden and Finland, regeneration failure near the tree line prompted the establishment of protective forests in the upper reaches of the forests. In addition, protective measures have for long been adopted on steep slopes.

Due to the different historical experiences within the Nordic countries the potential for further Nordic synergies in this field is high and might also have bearing globally. An example of the potential global aspect is the United Nations University – Land Restoration Training Programme (UNU-LRT) recently established in Iceland.

6.3 Forest biomass – fossil carbon substitution

Carbon in forest biomass is a part of the biosphere-atmosphere carbon cycle and its combustion does not permanently affect the atmospheric carbon concentrations as long as sufficient regeneration is secured. For this reason carbon emissions from biomass are not included as carbon emissions in the energy sector in the UN accounting system.

Undisturbed forests close to carbon saturation are close to neutrality in respect of overall net carbon exchange with the atmosphere. Sustainable forest management with forest biomass removal maintains the forest in a state of sustained carbon sequestration. Therefore, replacement of fossil fuel carbon by biomass carbon reduces the climate forcing effect of carbon emissions. This difference between types of combustible carbon is acknowledged in international agreements on carbon emissions.

Fossil fuel resources are non-renewable and with continued exploitation will ultimately be economically exhausted. The Selfoss Declaration acknowledges this imminent problem and that energy derived from forest biomass is an important replacement for fossil fuel resources.

Forest biomass carbon can replace carbon emissions from fossil fuels by 1) substituting fossil fuel as a solid primary energy source for stationary energy installations or providing a raw material source for conversion into liquid or gaseous fuels for engines of transport vehicles and 2) by replacing

fossil fuels as reagents in the metal smelting industries, e.g. as sinks of oxygen in the production of silicon and silicon alloys.

Economic and practical conversion of solid wood into liquid and gaseous fuels for engines of motion requires innovation that is largely outside the immediate sphere of forestry per se. However, the innovation within forestry needed for the economical and practical supply of forest biomass for stationary energy installations and the metal production industries would also benefit liquid biofuel installations based on forest biomass.

Forest carbon substitution for energy

The Nordic countries are net producers of energy and export more than half the total primary energy produced (53%; in 2006, Table 6.1). Fossil fuels, primarily oil and gas, make up about 79% of the total primary energy production. The sources and availability of primary energy vary greatly between the five Nordic countries (Åland included in statistics for Finland). In this respect the Nordic countries form three groups: 1) Denmark and Norway where production of fossil fuels dominates the energy sector, 2) Iceland with low carbon emission and plentiful renewable hydroelectric and geothermal energy sources and 3) Sweden and Finland highly dependent on imported energy but with significant forest biomass resources for renewable energy production of low climate forcing impact.

Table 6.1: Energy intensity (gross inland consumption of energy divided by Gross Domestic Product, GDP, measured in kilograms of oil equivalents per 1000 Euros), net imports of energy (1,000 tonnes oil equivalent), gross domestic energy consumption (1,000 tonnes oil equivalent), energy consumption per capita (tonnes oil equivalent per capita) and percentage of energy from combustion of biomass and waste of gross domestic energy consumption and percentage of renewable energy sources as a percentage of gross domestic energy consumption by the five Nordic countries, Denmark, Finland, Iceland, Norway and Sweden, and for all combined (Nordic). Data for Finland includes the Åland Islands.

Country	Energy intensity (kg oil equiv. per 1000 Euro)	Net energy Imports (1,000 x tonnes oil equiv.)*	Imports % of gross domestic energy consumption*	Gross Domestic Energy Consumption (1,000 x tonnes oil equiv.)	Energy consumption per capita (tonnes oil equiv. pr. capita)	Renewable energy (% of consumption)	Energy from biomass & waste (% of consumption)
Denmark	110	-8,059	-39%	20,924	3.9	14.1	11.5
Finland	229	20,946	55%	37,825	7.2	22.9	20.2
Iceland	359	1,099	25%	4,349	14.5	74.9	0.0
Norway	120	-197,561	-789%	25,037	5.4	46.4	5.1
Sweden	160	19,797	39%	50,341	5.6	29.4	18.7
Nordic	170	-163,778	-118%	138,476	5.6	29.8	15.0

Source: Eurostat (<http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>)

*Negative value for Net Energy Imports refers to net export of energy.

Denmark and Norway produce more fossil fuels than their total domestic energy use and both are net exporters of fossil fuels. The percentage of total

energy production from fossil fuels in 2006 (most recent complete data) was 90% and 95% for Denmark and Norway, respectively. Oil and gas from Norway alone is considerably more (152% in 2006) than total energy consumption in the Nordic countries combined.

Domestic primary energy production in Iceland is 100% renewable, primarily from hydroelectric and geothermal sources (99.9%). Nevertheless, the country derives a quarter of its energy consumption from imported fossil fuels. Iceland has still sufficient undeveloped economic hydroelectric and geothermal resources. The main limitation for zero dependency on fossil fuels is technical. The primary use of fossil fuels is for engines of moving vehicles in transport and fishing, i.e. automobiles, aeroplanes and ships. Currently, feasible and economic means of relaying energy from stationary energy installations (hydroelectric and geothermal) to engines of motion have not been introduced. The silicon industry is also a significant user of fossil fuels (coal and coke).

As expected from the composition of the energy sector the climatic footprint of the energy sector varies greatly among the countries, both in total emissions of carbon dioxide units and emissions per energy units per gross energy consumption (Table 3).

Table 6.2: Total greenhouse gas emissions (million tonnes CO₂ equivalent of all sectors) and domestic greenhouse gas emissions from the energy sector with percent of Nordic total emissions (year 2006) and average GHG emissions per unit of energy consumed (tonnes carbon dioxide equivalent per tonne of oil equivalent) for the five Nordic countries.

Country	Total national GHG emissions			Total GHG emissions from the energy sector		
	million tonnes CO ₂ eqv.	Percent of Nordic total	tonnes CO ₂ /toe	million tonnes CO ₂ eqv.	Percent of Nordic total	Tonnes CO ₂ /toe
Denmark	71.04	25.8%	3.4	30.28	34.9%	1.4
Finland	79.93	29.0%	2.1	32.85	37.8%	0.9
Iceland	4.24	1.5%	1.0	0.02	0.0%	0.005
Norway	53.47	19.4%	2.1	12.58	14.5%	0.5
Sweden	66.87	24.3%	1.3	11.15	12.8%	0.2
<i>Nordic total</i>	275.55	100.0%	2.0	86.88	100.0%	0.6

Average GHG emissions per unit of energy consumed
1 tonne oil eqv. = 11.63 MWh = 0.83 tonne C = 3.06 tonne CO₂

Forest energy

By far the highest volume of dedicated fuelwood is harvested in Sweden and Finland (11.2 million m³, 83% of the Nordic total). Fuelwood removals per person are also highest in these countries (Table 6.3). Nevertheless, only about a tenth of the total wood harvested in Sweden and Finland is for fuel, reflecting the importance of wood in industries. In Iceland fuelwood harvests are trivial, both in volume and per person. Denmark and Norway are intermediate in terms of fuelwood removals per capita (Table 6.3). However, most of the forest-based energy in Finland and Sweden is based on by-products from the whole forest utilisation chain (forest residues, bark, saw-

dust, rest pieces, lignin in black liqueurs, etc). Integrated production of pulp, paper, heat and electricity are becoming more and more common.

Table 6.3: Harvested dedicated fuelwood and total wood harvested in 2006 (m³ solid volume and percentage of Nordic total), harvested fuelwood per person (m³ solid volume per person) and percentage of total harvested wood of total increment as well as harvested fuelwood as percentage of total harvested by country and weighted average for the five Nordic countries, Denmark, Finland, Iceland, Norway and Sweden.

Country	Fuelwood*			Total wood harvested			Fuelwood % of national or Nordic total
	m ³	% Nordic total	Volume (m ³) per person	m ³	% Nordic total	Harvests % increment	
Denmark	1,162,400	8.6%	0.21	2,358,400	1.9%	35.5%	49.3%
Finland	5,290,309	39.1%	1.01	50,811,617	40.2%	69.5%	10.4%
Iceland	220	0.0%	0.00	820	0.0%	0.7%	26.9%
Norway	1,177,000	8.7%	0.25	8,594,000	6.8%	46.4%	13.7%
Sweden	5,900,000	43.6%	0.65	64,600,000	51.1%	85.5%	9.1%
Nordic total	13,529,709	100.0%	0.55	126,364,018	100.0%	35.5%	10.7%

Source: Eurostat (<http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>). Information for Iceland based on: Einar Gunnarsson 2007. Skógræktarárið 2006. Skógræktarritið 2007(2): 104–107.

* Fuelwood: Branches, twigs, logs, wood chips, and other wood products harvested primarily for heat or for conversion to a form of energy.

Presently, the Nordic forests, and particularly those of Finland and Sweden, are intensively managed as a raw material resource for wood using industries. The fundamental question for increased production of energy from forest biomass is thus: How can more biomass be extracted from the forest at a competitive cost without eroding the raw material base of the non-energy wood using industry or compromising biodiversity or the long-term productivity of the forest?

The forest biomass resource available for energy production without reducing the raw material base of the industry is primarily stumps, branches and tree tops as well as small or contorted trees. This available biomass for energy use is generally more costly to harvest and transport than straight logs of relatively large dimensions. Hence, cost per unit mass is an important constraint. Also, this biomass has much higher nutrient concentrations than the logs. In general, whole-tree harvesting is more disruptive to the site than conventional harvesting. Intensive biomass removal is therefore of concern for long-term productivity of the site. A too intensive removal of arboreal biomass is similarly likely to negatively affect biodiversity.

Presently, logging residues from final felling are the principal energy source (excluding the energy production within the chemical pulp production process). In order to increase the volume of available fuel technology, extraction of stumps and small trees must become more efficient. Another important task is to make transport more efficient as presently access is a primary limitation to increased supply of biomass.

Fuelwood harvests in total volume and per capita is presently similar in Norway and Denmark. In Denmark fuelwood removals are about half the total volume harvested and significant expansion of the forest resource is

relatively constrained by the limited land base and competition for land with agriculture and other land uses. However, expansion of short rotation willow crops will primarily be on present agricultural land.

Norway has a large but fragmented forest resource. Much of the forest is inaccessible on steep slopes, fragmented and with long haulage distances. The Norwegian Institute for Forests and Landscape (Norsk institutt for skog og landskap) has estimated that extraction of stumps, branches and tree tops from present harvests (about 10 million m³) could provide 16–25 TWh of energy. Extension of the road network opening inaccessible forests for biomass extraction could increase energy from stumps and slash to 26–35 TWh.⁶ Hence, there is considerable potential for increased production of energy from Norwegian forests by intensification of biomass removals but realization of the considerable forest energy resource depends on economic and efficient means of harvesting and haulage of forest biomass from stumps, slash and small trees.

Forest carbon substitution for industrial processes

During the industrial revolution the fossil fuels coal and coke replaced wood as the primary reduction agents of the metal production industry. Metal production is a significant source of greenhouse gas emissions. Wood and charcoal, on the one hand, and coal and coke on the other are generally interchangeable reduction agents in the metal smelting industries. By replacing fossil carbon by forest carbon in the metal production process considerable reductions in greenhouse gas emissions might be achieved. Cost and availability of wood biomass are the primary factors presently favouring fossil carbon in the metal manufacturing industries. Hence, innovation and development within the forestry sector is important for reduction in the climate impact of the metal production industry.

The Nordic silicon manufacturing industries are a good example of the challenges and opportunities for forest carbon substitution in industrial processes. In the silicon industry wood chips or charcoal are more expensive but technically superior reagents and commonly used as a minor component in order to increase the efficiency of the silicon manufacturing process. Charcoal could entirely replace coal and coke in the silicon industry, thereby reducing its climate impact from the present high down to nearly nil.

Among the Nordic countries, Norway and Iceland are almost the sole producers of silicon and silicon alloys, with minor production in Sweden reflecting the availability of relatively inexpensive hydroelectric energy. Presently, ferrosilicon production contributes about 9% of the total greenhouse gas emissions from Iceland and in Norway the silicon industry is also a significant source of GHG emissions. Hence, there is considerable oppor-

⁶ Pages 116–118: Regjeringen Stoltenberg II. St.meld. nr. 39 (2008–2009). Klimautfordringene – landbruket en del av løsningen. Tilråding fra Landbruks- og matdepartementet av 29. mai 2009, godkjent i statsråd samme dag. Det Kongelige Landbruks- og Matdepartement. Oslo. 177 pages.

tunity for reduction in climate impact by replacing fossil fuel carbon by forest carbon in the Nordic silicon industry.

The availability of forest biomass for replacing carbon in the silicon industry is very different in the two countries leading the Nordic silicon industry. Norway might have wood resources to supply its silicon industry. Iceland has presently a very limited forest resource but substantial land areas for afforestation. Furthermore, if carefully planned, afforestation of degraded land might provide multiple social and ecological benefits as well as establishing an industrial wood resource.

6.4 Policies on forest carbon

Countries have adopted multiple mitigation strategies to reduce unforeseeable effects. This is done either voluntarily or under compliance with the Kyoto protocol to which all the Nordic countries are signatories. The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) is a legal agreement that demands that signatories curb emissions to agreed levels and monitor and manage their terrestrial carbon pools. To date, all the Nordic countries except Iceland have elected forest management as a climate change mitigation strategy to meet their commitments under the Kyoto protocol. Iceland has elected soil restoration as a mitigation strategy.

All the Nordic countries monitor forest carbon stocks and stock change as required by the UNFCCC convention and the Kyoto protocol.

Forests as a carbon sink is only one of the many roles forests play in Nordic societies. In general various objectives of forest management are reconcilable with capture and storage of atmospheric carbon in the forests. Presently, forest policies reflect mostly values of the forests to society other than carbon management, but are generally perceived to serve an important role in climate policies.

The Danish forest policy emphasises the multiple role of forests to society. Two aspects of the Danish policy are important in respect to climate change: 1) emphasis on near-to-nature forestry and 2) afforestation. Near-to-nature forestry is expected to increase forest stability against storm events and in general the adaptability of the forest estate to climate change. It is an active policy to increase the forest cover from the present 13% of productive forests (14% total) to 20–25% of total land area within 80–100 years. These policies are likely to considerably promote mitigation of climate change both through increased storage of carbon and, potentially, through increased use of bioenergy to replace fossil fuels.

The forest policies of both Sweden and Finland put emphasis on protecting the environment and the economic productivity of the forest resource. Both countries actively promote forest biomass as an energy source through a range of policy instruments. In Sweden, for example, a carbon tax was introduced in 1991 on fossil fuels to start “internalising” the costs of climate

change. These policy instruments have functioned well, as between 1996 and 2007 the gross domestic energy use of the two countries decreased by 6% while energy produced from biomass and waste increased by 34%. Another principal driving force behind these policies has been the increased contribution of renewable energy in the total energy balance. In fact, energy security and greater reliance on renewable energy sources are stated objectives of the Selfoss Declaration and are clearly explained in the appendix to the declaration.

The Norwegian forest and climate policies emphasise the multiple role of forests and forestry for society and sustainable forest management. The policy supports more use of wood and increased carbon sequestration per unit area and by afforestation.

Iceland with its extensive deserts within the potential tree limits has adopted a climate policy of increasing carbon sequestration from the atmosphere through afforestation, revegetation, wetland reclamation, and changed land use. The current policies aim for an increase in forest cover from the present less than 1% to 12% of the land area by establishment of economically productive forests, active restoration of native birch woodlands, and spontaneous expansion of the indigenous woodlands.

6.5 Examples of research on forest mitigation

Institutions within all the Nordic countries are involved in a great many research projects that tackle different aspects of the mitigation role of forests and forestry. The multiple role of energy from the forest in substituting fossil fuel carbon, increasing the contribution of sustainable energy sources in total energy consumption, and increasing domestic energy security is prominent in current research efforts. Also, there is extensive research in the Nordic countries on carbon balances, following both changes in forest management and an increasing emphasis on afforestation.

In Sweden especially, but also in Finland, Denmark and Norway, for several decades (and still) much research has aimed to find the limits for sustainable utilisation of harvest residues (branches, tops and stumps) from a nutrient/acidity balance and biodiversity points of view. In addition, technical and logistical aspects of the bioenergy chain have been addressed. There is extensive research on carbon sequestration in the Nordic countries on carbon balances, following up both the changes in forest management and afforestation, mirroring the emphases on the agenda of Nordic forest co-operation.

The ad hoc group wants to highlight a new publication from NMR that presents the results of a large Nordic research project on the effects of afforestation on ecosystems, landscape and rural development (AFFORNORD TemaNord 2008:562). This project has amassed and made available a vast knowledge on the subject and includes many policy recommendations that are relevant to the Selfoss Declaration. Here we highlight the following:

- Afforestation makes a net contribution to reducing atmospheric CO₂ by carbon storage in growing biomass, vegetation and, sometimes, in soils.
- Careful selection of sites and species for afforestation and forest management practices can increase the net amount of carbon taken up and stored.
- If the main goal of afforestation is to store atmospheric carbon, it is not necessarily the fastest growing tree species under the most favourable conditions for tree growth that has the highest potential, i.e. under the condition that harvest will not take place.
- A further contribution is made when wood fuel substitutes for fossil fuel, and timber and wood products substitute for more energy intensive materials such as concrete or steel.
- Research on environmental services of afforestation and forests is a relatively new field, where better quantification of the impacts of management is needed, especially in terms of the challenge of balancing forestry practices with their effects on carbon sequestration and with economic, conservation and social objectives.

The SNS Centre of advanced research CAR-2005-5 OSCAR; Operations Systems – Centre of Advanced Research focuses on issues of more efficient forest biomass harvesting and extraction.

Bioenergy issues are also studied in the Northern European Innovative Energy Research programme 2009–2012. Nordic Energy Research in Oslo (Nordisk Energiforskning) is also active in bioenergy research. Currently effort is being put into economically feasible methods for conversion of forest biomass into liquid or gaseous fuels for the transport sector.

Among the Nordic countries, Finland and Sweden are leading countries worldwide in developing viable means for production and utilization of bioenergy from forests. Both countries have national research programmes tackling these issues.

The Finnish Forest Research Institute Metla has the programme *Bioenergy from forests (BIO)* (duration 2007–2011), with nine major research objectives:

- Produce research-based information on the principles and impacts of biomass production in forests and peatlands on forest resources.
- Develop sustainable silvicultural methods for forest biomass production and study the possibilities to cultivate energy crops also on peat and farm land.
- Develop inventory and planning methods for forest biomass resources.
- Promote the innovation and development of technology and logistics for forest biomass procurement.
- Support new entrepreneurship and creation of new business models in forest energy business.
- Join the researcher resources within the institute in the field of bioenergy research and support the creation of new researcher networks.

- Evaluate the impacts of increasing energy use of forests on the forest sector, including forest owners, forest machine entrepreneurs, and the forest and energy industry.
- Research and develop woody biomass and its properties as a raw material for biorefineries.
- Study, together with other Metla's research programmes, the impact of forest energy use on greenhouse gas and energy balances in Finland.

The Swedish Energy Agency operates a major Fuel Programme 2007–2010 in which the sub-project, Improved Forest Fuel, is a part. The Fuel Programme includes extensive research on the

environmental conditions necessary for increased extraction of forest fuels, both logging residues and stumps. The Programme studies the effects of climate change and anthropogenic activities on soil, water, carbon balances and other greenhouse gases and biodiversity. An aim is to provide the Forest Service with increasing updated decision support for the formulation of recommendations and rules for the sustainable extraction of forest fuel and possible nutritional compensation. The sub-project Improved Forest Fuel is led by Skogforsk in Sweden.

Efficiency is the key to increased use of bioenergy from the forest. Higher yields, more efficient transportation and better co-ordination with other forestry produce are all important issues for research. Presently, logging residues from final felling are the principal energy source. In order to substantially increase the volume of available fuel, technology for extraction of stumps and small trees is being developed. Also, more efficient transport of biomass is required as presently high transportation costs are an important limitation to an increased supply of biomass for energy.

Key objectives of current research at the Swedish forestry research institute Skogforsk:

- lower production costs for logging residue
- techniques and methods for utilization of stumps and small trees
- more efficient long-distance transport by truck and by truck and train combined
- increased fuel value through better procurement and treatment of material
- reduced fuel consumption in all operations
- new integrated planning systems (operation planning)
- development and efficiency of technologies and methods
- standardized procedures for buying and selling of forest fuel
- relevant information and training of forest owners and operations personnel

6.6 Concluding remarks

Sweden and Finland are at the forefront of forest biomass technology and Norway and Denmark are also advanced in that field. Iceland, Denmark and Norway have in-depth experience of afforestation in an oceanic climate. In Iceland great strides have been achieved recently in successful afforestation. Hence, there exist considerable opportunities for synergies by pooling resources among the Nordic countries and their neighbours in Europe in order to increase forest growth, manage the forest carbon pool and replace fossil carbon both in the energy sector and in the processing industries. Such an endeavour might be the essence of the Selfoss Declaration.

7. Forests and climate change – adaptation



The link between forests and global climate change is one of the key topics of the two-fold Selfoss Declaration. This chapter focuses on the adaptation aspect of climate change. Adaptation concerns how forestry can adapt to the emerging climate change situations. Regardless of a success in curbing global carbon emissions and enhancing carbon sequestration some climate change is by now inevitable and adaptation to altered climatic conditions is thus essential. The adaptation linkages between forests and climate change are discussed in this section of the report, highlighting the key elements of relevance for Nordic forestry.

7.1 Forest adaptation

Due to the high economic and social importance of Nordic forests and long production cycles in forestry the adaptation of forestry to climate change is an issue of central importance to the Nordic countries. The task of adaptive forest management has been described as a strategy of avoiding the unmanageable and managing the unavoidable.

In the Nordic countries a warmer climate may positively affect forest productivity, particularly in boreal Norway, Sweden, Finland and Iceland, where low temperatures and short growing seasons are limiting factors. Tree lines are expected to move up slope and northward, adding considerable areas to the potential forest base. Increased disturbance because of extreme weather

events such as gale force storms, changes in pathogen and pest regimes leading to more infestations, and a northward shift in biotic disturbance agents might counteract the expected gain in productivity. Also, as a result of global trading, forests are increasingly likely to suffer from novel pests and diseases. Site conditions may buffer or boost impacts of heat, drought and storm events. Abiotic and biotic impacts interact with climate change and anthropogenic pressures of air pollution and atmospheric deposition are making reliable predictions of future developments in the forests very difficult.

Coping with change

Sustainable forest management is the guiding principle of the Selfoss Declaration. For sustainable forest management in a changing world, change must be an intricate part of the management model. Adaptation of forestry to climate change is uniquely difficult. Other land uses such as most of agriculture have short production cycles of months or a few years and can thus adapt as changes occur. In boreal Norway, Sweden and Finland forest rotations are commonly 70–80 years and in the north even 80–120 years. Forest rotations in Denmark and southernmost Norway, Sweden and Finland are < 80 years for fast growing broadleaved trees, between 50–80 years for conifers and 80–150 years for deciduous trees. Considering the expected magnitude and rate of climate change and long rotations in forestry, trees planted today and surviving to the end of a normal rotation are bound to experience the full climate change expected during the present century.

Climate change presents a completely new challenge to forest management decisions as the forest management approach must be viable under present conditions as well as under climatic conditions that are continuously changing as time passes until the end of a rotation. The problem is thus not merely one of adapting to a new climate but coping with change itself.

Forest management decisions can no longer be based on past experience from the site in question. It is an implied assumption of the present forest management process that the environment is more or less constant with time, i.e. climate and other key ecological factors as well as human societies. This assumption has been a useful simplification but never strictly true. However, with expected climate change the validity of this assumption will be false and beyond usefulness.

An extremely important practical question is how do we optimize forest management decisions in a constantly changing environment at an uncertain rate or even direction, e.g. which species to plant, thinnings, rotation lengths and fertilization? In order to derive an optimum solution we must be able to foresee the outcome of the interaction of the management intervention and forest yield throughout the rotation.

Climate change constrains conventional yield models as well as most models of the forest ecosystem. At the heart of most of these models is a stabilizing function of cumulative growth on age, empirically derived. Even

models of a more flexible nature are calibrated on empirical data derived from forest systems that have experienced only moderate climate change compared to the change expected in the present century. It is imperative for success that decisions in a changing environment are based on models incorporating effects of climate change.

Uncertainty of rate and pattern of climate change also call for inclusion of probabilities of outcome into the management process. Without such an approach sustainable management strategies cannot be implemented. This is a key question for research and sustainable forestry practice.

Decisions in forestry that affect the distribution of species and whole rotations affect the utilities of both the present and future generations. Sustainability and intergenerational equality are ongoing issues in forest management. With climate change it is even more important to balance the interests of the present and future generations.

Forest adaptation strategies

Adaptation strategies might be either passive or active. By passive adaptation a decision is taken not to implement measures in order to resist changes in forest structure or composition or which actively adapt the forest to environmental changes. This non- intervention approach relies on spontaneous adaptation by natural succession and species migration. The passive adaptation strategy minimizes the input effort, but at the same time eliminates many possibilities to control the stand dynamics that are important for future forest composition, stand structure and forest functioning.

Criteria for the use of this option are: (i) low importance of the forest stand for economic and ecological functioning, (ii) inadequate means for active adaptation, and (iii) low cost of control measures⁷. The passive management approach is generally the norm in nature reserves, although active measures to resist the spread of non-native species are frequently adopted in protected areas. Due to the expected rate of change and fragmentation of ecosystems a passive approach might not be sufficient to maintain elements of biodiversity. Hence, active management measures might be necessary even in strict nature reserves to avoid extinction of elements of biodiversity.

In a Nordic context a passive approach might be viable for the mountain birch woodlands in Norway, Sweden, Finland and Iceland, but would hardly be a realistic option for the economically important forests of Sweden, Finland and Norway, the multiple use forests of Denmark or the more recent plantations in Iceland with economic and social objectives.

Active forest management strategies can either be resistant to change (conserving existing structure and composition) or adaptive, i.e. facilitating change. The objective of the conservation approach is to maintain the structural constancy of a forest even against increasing successional pressure due to environmental change in order to achieve the original management goals.

⁷ Bolte et al. 2009

An important drawback of the conservation approach is increasing risk of catastrophic loss of forests. In the short term and for stands already at an advanced stage in the rotation the conservation approach might be appropriate for the management of the commercially, ecologically or socially valuable forests of the Nordic countries. For the relatively young forest plantations in Iceland the conservation approach might be a less desirable short-term procedure. Considering the relatively large anticipated climate change expected within the present century, this conservative and inflexible management option would hardly be viable for forest stands of young age.

The active adaptation strategy entails the use of silvicultural methods (e.g. tending, thinning) to change stand structures and composition in a way that the resulting forest is better adapted to climatic change impacts than it otherwise would be by natural progression. One option is, for example, shortening of rotation periods to mitigate windthrow. Active adaptation also includes the active transformation of forest in order to replace or admix tree species sensitive to climate change with tolerant species (native as well as introduced species or provenances) that are potentially better adapted to future climate conditions. Such information can be retrieved from regional risk analyses, “climate envelope” analyses or “climate matching” approaches. As a long-term approach some form of active adaptation would seem necessary to maintain the uninterrupted services of Nordic forests.

Adaptive forest management to climate change aims to preserve and develop the functionality of forests as a prerequisite for fulfilling the future need for forest ecosystem services. It is a dynamic approach to forest management in which the effects of treatment and decisions are continuously monitored and used, along with research results, to modify management on a continuing basis to insure that objectives are being met. Adaptation could be achieved by either keeping or changing forest composition and structures.

Shorter rotations and mixing of species and structures (e.g. age classes) in the forest are adaptive approaches that might reduce risk of forest failure against uncertain future climate change. Forests with complex species and structural composition might also provide more services. However, the management of complex forests is problematic and costly compared to less composite forests.

Genetic adaptation

Species and genotypes presently well adapted to current climate at a given site might become poorly adapted to that site as a result of expected climate change. The Selfoss Declaration emphasizes the importance of genetic adaptation to climate change and in particular the role of tree breeding in that process. Conservation of genetic variability within tree populations is important for current breeding work and to maintain genetic characteristics that might prove useful under future conditions.

Climate change involves a considerable geographical shift in growing conditions, in many cases transcending national boundaries. The phenology is generally genetically controlled and is believed to be a combined response to the seasonal progression of temperature and light combinations. Following a northward shift in conditions the annual temperature cycle may no longer fit the provenance at the reference site nor further north where temperatures might be similar to those previously experienced at the original reference site. Tree breeding is particularly important to secure reproductive material that is well adapted to a site, provides high yields and maximum services. Thus two different strategies are useful for accelerating the adaptation of forest trees to the climatic changes: by transfer and then promote local adaptation of potentially suited reproductive material of native or non-native species, or by tree breeding for changing climatic conditions. A successful breeding program will contain several breeding populations that are bred for adaptation to various combinations of light and temperature conditions, as well as combinations that are outside the present normal conditions in the Nordic countries. In both strategies there is an obvious potential for Nordic co-operation, this being a region with large similarities in climatic conditions. The countries in the region also follow similar strategies and guidelines for sustainable forestry.

7.2 Policies on forests and adaptation to climate change

The five Nordic countries have all published analyses of adaptation policies to climate change as well as policy statements. In general, these statements suggest measures for adaptation of forests or forestry within the framework of the present forest policy rather than suggesting amendments to current forest policies.

Regulation of forest genetic material

The Swedish and Norwegian forest acts are generally prescriptive, controlling silvicultural treatments as well as the use of species and provenances, irrespective of ownership. The Danish, Finnish and Icelandic forest laws are less prescriptive.

In Iceland the use in forestry of tree species and provenances is generally outside official control. In other Nordic countries the use in forestry of reproductive material is highly regulated, both in terms of indigenous as well as introduced species and irrespective of ownership of the forest land. In Norway and Sweden, forestry legislation and regulations limit the transfer of genetic material both in elevation and latitude.

All the Nordic countries have laws and regulations enabling the state to control the use of non-native tree species. However, the degree of control varies greatly among the five countries. According to the Norwegian Nature Diversity Act non-native tree species may not be planted in the natural envi-

ronment without a permit which should not be granted if there is reason to believe that the release will have substantial adverse impacts on biological diversity. The corresponding Finnish law places similar general limitations on the use of plants other than trees, but specifically excludes tree species for forestry use. The Swedish forestry act strongly controls the use of introduced tree species but allows the cultivation of lodgepole pine from North America within certain geographical boundaries. The Danish laws do not prohibit the use of non-native tree species; the forest policy promotes the use of native species but in general it is up to the owner and forest manager to choose species and provenances serving the objective of forestry at the site in question. In Iceland the use of non-native species, including trees, is prohibited on recent lava fields (less than 10,000 years of age), above 500 m in elevation and in nature reserves. Legislation on the conservation of the natural environment and associated bylaws have instruments for listing species that are allowed for cultivation or disallowed and under what condition cultivation is permitted.

7.3 Research an adaptation to climate change

Research on forest tree breeding

The Selfoss Declaration specifically emphasises the role of forest genetics and tree breeding, in particular for adaptation of Nordic forests to climate change. Forest tree breeding and forest genetic research are long-term activities that have a strong bearing on the potential future development of cultivated forests. Both current and future climate is central to selection of reproductive material and tree breeding work.

Forest tree breeding utilises the large genetic variability of forest tree species to produce well adapted reproductive materials with a higher survival, volume and quality production and with a sufficient genetic diversity. Thus, the Nordic breeding organisations have demonstrated that bred materials are superior in several respects compared to reference materials. Breeding also has the potential for developing reproductive materials with resistance to pests and insects. In addition, the increase in forest growth will contribute to enhanced CO₂ uptake and thus to counteract climate change. Forest tree breeding is a long-term investment, both for efficient wood production and for climate change mitigation. It also offers a potential for stronger commitment and collaboration among the Nordic breeding organisations, and perhaps in the entire Baltic Sea region, due to similarities in climatic conditions and the potential to develop common breeding populations.

Parallel to breeding there is a need for forest genetic research and development activities. Both population, quantitative and molecular genetics are important fields of research, as well as the general biology of the species bred. Important research issues include how to strike a balance between genetic improvement and genetic diversity, in order to secure both short-

term benefits and long-term flexibility, and how to select for reproductive materials that express their superiority across varying environmental conditions. In order to secure materials for long-term breeding both in situ and ex situ conservation activities are needed.

In each of the Nordic countries there is one organisation that is responsible for tree breeding and one or more institutions that do forest genetic research. As an example the Norwegian Forest Seed Center (Skogfrøverket) provides seeds for the Norwegian forestry and is also responsible for all practical tree breeding activities. The Seed Center closely co-operates with the Section of Forest Genetics at the Norwegian Forest and Landscape Institute, which conducts the breeding research.

In Denmark, a project has been initiated with the objective of conserving in situ the genetic resources of the forests. The project focuses on cultivated tree species as well as lesser tree species and shrubs.

At the Nordic level, both SNS and NordGen Forest are involved in the field of forest genetics and conservation of forest genetic resources. SNS supports individual research projects with participating institutions from the Nordic countries, and the GENECAR network initiates and co-ordinates Nordic forest genetics research. NordGen Forest is active in the conservation and use of forest genetic resources. In both organisations projects that are important for genetic adaptation of forestry to climate change have high priority.

The Nordic countries individually or in co-operation are involved in a number of forest genetics research projects of significance for adaptation to climate change. “Novel Tree” is an example of a major research initiative to develop and improve breeding strategies and selection criteria for future climate situations. Fifteen European research organisations collaborate in the project that is supported by the European Union. The Swedish Forest Research Institute (Skogforsk) is, for example, involved in several research projects within “Novel Tree” that focus on plant behaviour in the future climate, such as plant phenotypic response to climate change (phenology) and models for new recommendations for use of genotypes where climate change is included.

Research on forest management in a changing climate

Much research is going on in which experts on various subjects of forest science are analysing the effects climate change may have on features like tree growth, insect damage, pathogens, frost risks, wind-felling, biodiversity, etc. Some research projects have tackled these issues in a more integrated manner.

An example from Sweden is the Mistra project “Future Forest – sustainable strategies for uncertainty and risk”. The project is a collaboration between the Swedish University of Agricultural Sciences (SLU), Umeå University and The Swedish Forest Research Institute. The project explores how biodiversity is affected during various future climatic scenarios, including possible vegetative changes due to increased intensity of forest management and a warmer climate.

An example from Finland is the Metla project “Functioning of forest ecosystems and use of forest resources in changing climate (MIL)”. This research programme aims to produce information on the impact of climate change on forest ecosystems and understand forest and environmental policy actions and means that will hopefully help mitigating and adapting to climate change. The programme also produces information in support of the greenhouse gas reporting dealing with forests in Finland.

7.4 Concluding remarks

The inevitable climate change will introduce new challenges to the Nordic forest ecosystems and forestry practices. For the forestry sector to cope with climate change there is an emerging need for different adaptation strategies. We find a great knowledge and capacity within the Nordic countries to adapt. Still, we need to strengthen research as well as to take new co-ordinated actions to address the emerging changes.



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Introduktion

I augusti 2008 träffades de nordiska ministrarna och statssekreterarna med ansvar för skogsbruk, från Danmark, Finland, Island, Norge, Sverige och Åland i en konferens i Selfoss, Island. Ämnet för konferensen skogarnas betydelse när det gäller att möta två av dagens viktigaste miljöutmaningar – global klimatförändring och global administrering av sötvattensresurser. Särskild uppmärksamhet gavs till beskogningsprojektet på berget Hekla i Island, där skogar återställs på kalområden som har skapats av en kombination av vulkanutbrott och avverkning. Konferensen avslutades med en ministerdeklaration – Selfoss-deklarationen om hållbart skogsbruk.

Denna rapports syfte

Syftet med denna rapport ”*Rekommendationer för uppföljning av Selfoss-deklarationen om skogar, klimat och vatten*” är att ge rekommendationer till ämbetsmannakommittén för skogsbruk i det nordiska ministerrådet (Nordisk ämbetsmannakommitté för skogsbruk) och andra relevanta aktörer inom nordiskt samarbete inom skogsbruk, hur Selfoss-deklarationen kan implementeras och följas upp.

Denna rapport presenterar det arbete som har utförts av den ad hoc-grupp som Nordisk ämbetsmannakommitté för skogsbruk har utnämnt. Ad hoc-gruppens uppdrag finns i Bilaga I.

Ad hoc-gruppens arbete utgick från frågorna hur skogar och skogsbruk i de nordiska länderna kan, på ett hållbart sätt, påverka och påverkas av:

- klimatet genom
 - begränsning av klimatförändringar
 - anpassning till klimatförändringar
- sötvattensresurser

Rapporten har delats upp i tre sektioner.

Sektion *ett* ger en introduktion till rapporten, presenterar arbetsgruppen och rapportens målsättningar och beskriver hur bakgrundsinformation som utgör grunden för hur policy-rekommendationerna samlades in och analyserades.

Sektion *två* inkluderar Selfoss-deklarationen och en bilaga som klargör de olika resolutionerna. Den presenterar också de föreslagna policy-rekommendationerna för implementering av Selfoss-deklarationen.

Sektion *tre* tillhandahåller bakgrundsinformation för de föreslagna policy-rekommendationerna och ger en djupgående analys av de utmaningar som presenteras i deklarationen. Den markerar vidare kontrasterna mellan de

nordiska länderna när det gäller frågor som är relevanta för Selfoss-deklarationen och potentiella synergier som kan uppstå genom samarbete inom dessa frågor. Den nordiska samarbetsstrukturen beskrivs och om hur de frågor som berörs av deklarationen passar in i denna. Rapporten berör också mera i detalj, huvudfrågorna inom Selfoss-deklarationen med tyngdpunkt på nuvarande policys och forskningsinsatser.

Ad hoc-arbetsgruppen

Ad hoc-gruppen har utgjorts av följande personer:

- *Jón Geir Pétursson*, Miljödepartementet, Island, ordförande
- *Pernille Karlog*, Miljödepartementet, Danmark
- *Sune Haga*, SamNordiskSkogsforskning (SNS) sekreterare, Finland och SNS
- *Birgitta Naumburg*, Jordbruksdepartementet, Sverige (Sverige ordförandeskap 2008)
- *Tore Skrøppa*, Norsk institutt for skog og landskap, Norge och NordGen Skog
- *Danfríður Skarphéðisdóttir*, Miljödepartementet, Island.
Representerar Nordiska ämbetsmannakommittén för miljöfrågor.

Sekreterare för gruppen har varit Hrefna Jóhannesdóttir, projektkoordinator för Nordiska ämbetsmannakommittén för jordbruk och skogsbruk.

Förutom denna grupp har Mikael Sandvik vid Ålands landskapsregering, skogsbruksbyrån konsulterats.

Þorbergur Hjalti Jónsson, skogsvetare vid Islands skogsforskning Mógilsá, har anlitats för att samla in relevant information kopplat till Selfoss-deklarationen, bakgrundsinformation samt assisterat vid analyserna och rapportskrivningen

Metodologi

Gruppen hade sex formella möten under 2009 och 2010. I Reykjavík den 28 mars och den 30 juni, i Stockholm den 10 september, i Reykjavík den 21 oktober samt i Köpenhamn den 27 november och den 29 januari 2010.

Gruppen genomförde en kartläggning över den aktuella situationen inom och bland de nordiska ländernas gällande policy, lagar och bestämmelser samt implementering och forskning, relevant för Selfoss-deklarationen. Gruppen analyserade Selfoss-deklarationen och identifierade de nyckelfrågor som presenterades. Ett formellt frågeformulär, grundat på denna analys, utarbetades och sändes till de länder som hade undertecknat deklarationen. Länderna ombads klargöra policys, lagar och bestämmelser, implementering och forskning som var relevanta för nyckelfrågorna i Selfoss-deklarationen och att tillhandahålla kopior på dokument eller webblänkar som var relevanta för deras svar. Svaren

på frågeformuläret, de dokument som tillhandahölls och även andra dokument som samlades in under arbetet, har utgjort bakgrundsinformation till denna rapport samt grunden för policy-rekommendationerna.

Frågeformuläret är bifogat som Bilaga II.

Selfoss-deklarationen om hållbart skogsbruk

Nordiska ministerrådet – Skogsbruksministrarna. Den ministeriella deklarationen antogs i Selfoss, Island den 19 augusti 2008

Danmarks, Finlands, Islands, Norges, Sveriges och Ålands ministrar för skogsbruk har på skogsministerkonferensen i Selfoss, Island den 19 augusti 2008 diskuterat hållbart skogsbruk med fokus på vatten och klimat.

Brukandet av de nordiska skogarna har haft en unik betydelse för utvecklingen av det nordiska välfärdssamhället.

Nordens befolkning har ett nära förhållande till skogen. Sedan tidernas begynnelse har skogen gett människor skydd, material till hus och byggnader, energi samt föda från växter och vilt. I modern tid utgör de nordiska skogarna en resurs för ekonomisk utveckling i Norden, samtidigt som skogen är viktig för rekreation och biologisk mångfald. Detta visar helt tydligt skogens många värden och funktioner.

Två av vår tids viktigaste miljöutmaningar har en koppling till skogen; den globala klimatförändringen och den globala förvaltningen av färskvattenresurser. De nordiska skogsministrarna – som samlats till konferens i Selfoss, Island den 18-19 augusti 2008 – vill lyfta fram skogens betydelse för att möta dessa två utmaningar.

De nordiska skogsministrarna konstaterar att livskraftiga skogar som genererar råvaror och tjänster till industrin, en mångfald av växter och djur samt en fristad för rekreation är en förutsättning för ett konkurrenskraftigt skogsbruk i Norden, och

- vill, med hänsyn till skogens biologiska mångfald och rekreationsmöjligheter, verka för ökad hållbar biomassaproduktion i Nordens skogar vilket är en viktig åtgärd för att motverka klimatförändringarna samt för att minska konkurrensen mellan odling av biomassa för bioenergi och för andra ändamål
- lägger stor vikt på skydd och skötsel av skogar där syftet är att säkra ekosystem, biodiversitet, grundvattnet samt motverka erosion och skydda vattendrag
- konstaterar att beskogning bör öka och att skogsskötsel och användning av trä bör utvecklas med utgångspunkt i gemensamma europeiska riktlinjer för att skapa livskraftiga skogar och därmed motverka negativa konsekvenser av klimatförändringar
- lägger vikt på att skogsektoren deltar aktivt och konstruktivt i diskussionen om skogens roll i klimatsammanhang för att möjliggöra att

skogens potential kan brukas optimalt, och att de åtaganden som görs grundar sig på hållbar skogsskötsel.

- *vill förstärka* samarbetet och erfarenhetsutbytet inom Norden, så att nordiska skogsbrukare får tillgång till och kännedom om hur de på ett resurseffektivt sätt kan ta hänsyn till skogens vatten och hur de kan anpassa skogsskötsel till följd av klimatförändringarna.
- *betonar vikten* av skogsträdsförädling, bland annat genetisk anpassning till klimatförändringar och att vidta åtgärder när det blir nödvändigt.
- *lägger stor vikt* vid skogens lokala och regionala betydelse för en sund ekonomisk utveckling, till exempel intäkter från turism- och jakt, vilket är en förutsättning för aktiv skogsskötsel och därmed en vidareutveckling av skogens betydelse i klimatsammanhang och vattenförvaltning.
- *stödjer* att skogar som syftar till att till exempel skydda mot erosion, bevara biologisk mångfald eller som etableras för rehabilitering av eroderade markområden, också bör kunna brukas och användas till virkesproduktion så länge detta bidrar till att tillvarata dessa skogars ekologiska, sociala och ekonomiska värden.
- *konstaterar* att det krävs högkvalitativ forskning och innovation på alla dessa områden och att det krävs ett ökat samarbete för att nordisk skogsforskning även fortsättningsvis ska ligga i spetsen i internationella sammanhang.

Pórunn Sveinbjarnardóttir, Miljöminister, Island

Eskil Erlandsson, Jordbruksminister, Sverige

Troels Lund Poulsen, Miljöminister, Danmark

Ola T. Heggem, Statssekretær, Norge

Jouni Lind, Statssekretær, Finland

Jan-Erik Mattsson, Landskapsregeringsledamot, Ålandsöerne

Bilaga till Selfoss-deklarationen

Skogs- och vattenkvalitet

Vatten utgör basen för allt liv på jorden och det blir allt tydligare att tillgång till rent dricksvatten är en förutsättning för god livskvalitet. Skogen gör att ytvattnets flöde blir långsammare och att föroreningar effektivt filtreras från det vatten som strömmar till vattenkällor. Samtidigt förbättrar skogen villkoren för fisk i sjöar och vattendrag, genom att utgöra en födokälla för vattenorganismer. En bra försäkring för produktiva vattenekosystem, hög vattenkvalitet och mindre risk för översvämningar är att skogen inom avrinningsområdet brukas på ett långsiktigt hållbart sätt, med hänsyn till vatten.

Skogar – bioenergi, förhöjda energipriser, globalisering

Världens befolkning har förstått att oljekällor inte är outtömliga. Den ständigt ökande efterfrågan på olja gör att det är en stor fråga hur länge källorna kommer att räcka. Det finns starka skäl att tro att med stigande oljepriser kommer skogen att bli en viktig energikälla. En ökad produktion av biomassa i skogen är önskvärd som även tar hänsyn till skogens ekologiska och sociala värden.

Skogen som motvikt mot klimatförändringar – kolsänkor

Över hela världen är man bekymrad över den ökade växthuseffekten och det är klart att utsläpp av CO₂ till atmosfären måste motverkas med alla medel. De flesta länder har mål för att minska utsläppen av växthusgaser och utvecklar strategier för att minska netto-utsläpp. Åtgärder för att minska utsläpp bygger bland annat på skogens stora potentiella förmåga att binda CO₂. Därför måste avskogningen stoppas och skogens produktionsförmåga ökas genom förbättrad skötsel. Det gäller också för de länder där det finns möjligheter att öka skogsarealen genom beskogning, och där det inte råder kraftig konkurrens om mark för till exempel matproduktion.

Skogssektorns anpassning till klimatförändringar

Trots alla åtgärder för att minska utsläpp av växthusgaser, är det sannolikt att väsentliga klimatförändringar kommer att ske, eftersom atmosfärens CO₂-halt redan har ökat signifikant. Det är rimligt att förvänta sig bl.a. en förändrad frekvens av stormskador i skogen, torka, skogsbrand och insektskador som en följd av klimatförändringar. Skogssektorn måste anpassa sig till sådana miljöförändringar och där spelar förstärkt forskning inom området en mycket viktig roll.

Trädens genetiska anpassning

Träd har en otrolig förmåga att anpassa sig till klimatförändringar. Anpassningen kan däremot ta tid och det är sannolikt att förändringarna sker så snabbt att trädens genetiska anpassning inte hinner med. Vi har god kunskap om de nordiska skogsträdens anpassning och genetiska variation, men det är viktigt att förstärka denna kunskap betydligt för att få en bättre grund till beslut om vilka trädslag och provenienser som kommer att bli användbara i en förändrad miljö.

Skyddsskogar – "Heklas skogar"

Skogen binder jord och förhindrar därmed jordflykt och erosion. I vissa delar av världen med av skogningsproblem finns det nu stora eroderade områden utan vegetationstäck. Detta skapar miljöproblem för dessa länder och

deras invånare och där är det viktigt att öka beskogning för markskydd och erosionsbekämpning. Sådana problem förekommer även i Norden i nutid, bland annat i Island.

Tonvikt på forskning

Forskning är en förutsättning för goda resultat i skogsvård och skogsförvaltning. Utan forskning, utveckling och innovation blir utfallet stagnation och förfall. Internationellt är de nordiska länderna framstående i skoglig forskning och utveckling. För att trygga vår ledande ställning inom den internationella skogssektorn måste vi verka för en stark nordisk skoglig forskning framöver.

Rekommendationer för implementering av åtagandena inom selfoss-deklarationen

Deklarationen består av nio delvis interrelaterade resolutioner som markerar skogsbruksministrarnas prioriteringar.

Ad hoc-gruppen ger följande rekommendationer till genomförandet av Selfoss-deklarationen. Rekommendationerna är tvåfaldiga, först policy-rekommendationer till de nordiska samarbetsorganisationerna och därefter konkreta åtgärder som inkluderar olika aktiviteter som kan utföras av olika nordiska aktörer. Formuleringen av rekommendationerna grundar sig på analyserna som presenteras i Sektion III.

Gruppen föreslår inte, i de flesta fall, exakta tidsgränser för de olika aktiviteterna, utan att de ansvariga aktörerna bör beakta de olika åtgärderna genast.

Strukturella policy-rekommendationer för nordiskt samarbete för att underlätta implementering av Selfoss-deklarationen

Ad hoc-gruppen observerar att strukturen för det nuvarande nordiska skogsbrukssamarbetet fungerar och är den är högst kapabel att möta Selfoss-deklarationens utmaningar och att utföra de direkta åtgärder som föreslås. Många av de frågor som tas upp i deklarationen finns redan på det nordiska skogsbrukssamarbetes agenda. Dock rekommenderas följande policy-prioritetringar för att säkra dess implementering:

- SamNordisk Skogsforskning (SNS) fortsätter att samla den nordiska kompetensen inom deklarationens omfattning. Det kan företrädesvis ske genom att underlätta aktiviteterna för specifika Centres of Advanced Research (CAR) inom området skogar och klimat, respektive vatten.
 - Detta riktas mot SNS:s styrelse för beaktande och uppföljning.
- SNS stödjer samarbete med Nordisk Energiforskning (NEF) och Nordiskt Kontaktorgan för Jordbruksforskning.
 - Detta riktas till SNS:s styrelse för uppföljning.
- Ad hoc-gruppen välkomnar initiativet att ansluta SNS med EFI och yrkar på att samarbetet fokuserar på projekt som inkluderar relationen mellan skogar, vatten och klimat.

- Detta riktas till SNS:s styrelse för uppföljning.
- NordGen Skog får en starkare position inom NordGen, eftersom behovet för anpassning av träd till klimatförändringar är oundvikligt under kommande år.
 - Detta riktas till NordGen:s styrelse för beaktande och uppföljning.
- Givet de nordiska skogarna betydelse för de nordiska ländernas klimatåtaganden bör det finnas ett starkare samarbete mellan Nordiska ämbetsmannakommittén för miljöfrågor och Nordiska ämbetsmannakommittén för skogsbruk inom frågor om klimatförändringar. Det är Nordiska ämbetsmannakommittén för miljöfrågors uppgift att utveckla nordiska strategier för klimatförändringar och att bidra till förhandlingarna om klimatförändringar.
 - Detta riktas till både Nordiska ämbetsmannakommittén för miljöfrågor och Nordiska ämbetsmannakommittén för skogsbruk för beaktande och uppföljning.
- Det är viktigt att NMR inte vidare minskar de redan snäva budgetarna till SNS och NordGen, utan snarare ökar budgeterna så att SNS och NordGen kan koordinera högkvalitativ nordisk skogsforskning med nätverk och projekt.
 - Detta riktas till både Nordiska samarbetskommittén och Nordiska ämbetsmannakommittén för skogsbruk , för beaktande och uppföljning.
- Ad hoc-gruppen föreslår att SNS och NordGen Skog börjar samarbeta med de olika intersektoriska strategierna inom nordiskt samarbete för frågor som rör skog, klimatförändring och vatten. Detta kommer att underlätta implementering av resolutionerna i Selfoss-deklarationen. Gruppen understryker följande strategier: Hållbar utveckling, Östersjön, Globaliseringsinitiativet, grannar i både öst och väst (eventuellt andra strategier).
 - Detta riktas för uppföljning till Nordiska ämbetsmannakommittén för skogsbruk samt till styrelserna för NordGen och SNS.

Specifika åtgärder som rekommenderas för implementering av Selfoss-deklarationen.

Grundat på analyserna i Sektion III har ad hoc-gruppen skapat en lista över rekommenderade åtgärder. Tabell 2.1 sammanfattar de föreslagna åtgärderna. Åtgärderna presenteras inte i någon särskild prioritetsordning och numreringen som ges är endast avsedd för referensändamål. Beslut om prioritering samt vilka av de föreslagna åtgärderna som ska implementeras och till vilken grad, kommer att fattas av Nordiska ämbetsmannakommittén för skogsbruk.

Tabell 2.1 Rekommenderade åtgärder för att implementera åtagandena i Selfoss-deklarationen

Åtgärd	För imple- men-tering av resolution punkt num- mer	Föreslagen aktivitet	Kort beskrivning
1	1, 2 och 3	Workshop	Hur kan hållbar produktion av biomassa från skogen öka?
2	5	Skrivbordsstudie	Hur kan praxis för skogsbruk möta och anpassa sig till krävande klimatförändringseffekter?
3	5	Seminarium	EU:s vattenramverk och nordiskt skogsbruk
4	4	Webbportal	Att samla in och sprida forskningsresultat som är relevanta för Selfoss-deklarationen
5	9	Främjande och publicering	Att främja kunskap om och att informera om betydelsen av skogen för klimat och vatten
6	3 och 4	Workshop och publicering	Främja de nordiska skogarnas potential att begränsa klimatförändringar
7	3	Skrivbordsstudie	Analys och publicering av strategier för skogsvård, för att begränsa klimatförändringar i de olika typer av skogar som finns i de nordiska länderna
8	3	Skrivbordsstudie	Studier och rekommendationer om hur gemensamma europeiska riktlinjer för skogsplantering/återbeskogning kan appliceras i de nordiska länderna
9	3	Workshop	Workshop om hur nordiskt virke i permanenta konstruktioner kan marknadsföras
10	8	Skrivbordsstudie	Exempel på god praxis rörande återställning av skog i områden som inte har brukats på ett hållbart sätt.
11	8	Workshop	Skyddsskogsbruk, inklusive nya och alternativa former av skogsskydd
12	6	Projekt, fälttester	Utveckla reproduktiva material för framtida klimatförhållanden
13	6	Samarbete och utbyte	Ökat samarbete inom nordisk skogsträdsförädling och förädlingsforskning
14	6	Skrivbordsstudie	Övervaka möjliga förändringar av den genetiska mångfalden av träarter under skiftande klimatförhållanden
15	2	Skrivbordsstudie	Samla in exempel på hur bevarande av biologisk mångfald har integrerats i policy och praxis för skogar i de nordiska länderna
16	2 och 1	Skrivbordsstudie - bidra till åtgärd 1.	Betydelsen av dött och multnande virke för skogens biologiska mångfald
17	2, 3 och 6	Skrivbordsstudie	Riskbedömning av nya arter av skogsträd
18	2	Informationssystem	Risikanalys och etablering av ett system för att behandla potentiella patogener inom nordisk skogsvård som ett resultat av klimatförändringar
19	2, 3 och 7	Skrivbordsstudie	Samla in och analysera exempel på skogsodling/planteringsprojekt i de nordiska länderna där förmånerna från utsläppskrediter har varit den drivande kraften
20	7	Konferens	Lokal och regional betydelse av de nordiska skogarna

Åtgärd 1

Aktivitet: Nordisk workshop

Ämne: Hur kan hållbar produktion av biomassa från skogen öka?

Denna åtgärd berör punkterna 1, 2 och 3 i Selfoss-deklarationen. Workshopen ska fokusera på hur de nordiska länderna kan öka en hållbar produktion av biomassa i sina skogar. Syftet är att öka kunskapen om vad som är praktiskt möjligt idag och vad som kan bli möjligt i framtiden. Som underlag till workshopen bör en kartläggning genomföras om vad som i dag är möjligt och vad som redan görs i de nordiska länderna. En sådan kartläggning skulle kunna genomföras av SNS. Arbetet bör också byggas på resultat från tidigare NMR-projekt inom ämnesområdet. En publikation om vad som tagits upp och diskuterats under workshopen, inklusive förslag till fortsatta åtgärder, ska utarbetas med målsättningen att lämna den till Ministerkonferensen i Norge 2011 (FOREST EUROPE, tidigare MCPFE).

Målgrupp: Forskare, skogs- och miljömyndigheter, skogsägarföreningar, skogsindustrin, miljö- och fritidsorganisationer.

Senaste datum: För att publikationen ska kunna bli klar till juni 2011 behöver workshopen hållas senast våren 2011 och kartläggningen göras senast vintern 2010.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, NMR-ordförandeskap, finansiering från finansieringskällan Hållbar utveckling.

Åtgärd 2

Aktivitet: Skrivbordsstudie

Ämne: Hur kan praxis för skogsbruk möta och anpassa sig till krävande klimatförändringseffekter?

Denna åtgärd berör punkt 5 i Selfoss-deklarationen. Kunskapssammanställning om att anpassa skogsskötsel i de nordiska skogarna till följd av klimatförändringarna. Studien ska ge svar på följande frågor: (a) Hur bedrivs skogsskötseln i dag i de nordiska länderna? (b) Rekommendationer om hur nordiskt skogsbruk kan anpassa sin skogsskötsel samt (c) om det krävs åtgärder från skogsbruket eller det offentliga. Resultatet ska på lämpligt sätt spridas så att kunskapen når skogsbruket i Norden.

Målgrupp: Nordiska skogsägare, nordiska skogsdepartement och Nordiska ämbetsmannakommittén för skogsbruk.

Senaste datum: 2011

Ansvar: SNS (SamNordisk Skogsforskning).

Föreslagen finansiering: Globaliseringspuljen, Hållbar utvecklingspuljen, Nordiska ämbetsmannakommittén för skogsbruk, NMR-ordförandeskap, SNS.

Åtgärd 3

Aktivitet: Nordiskt seminarium

Ämne: EU:s vattenramverk och nordiskt skogsbruk

Denna åtgärd berör punkt 5 i Selfoss-deklarationen. Ett seminarium om hur det nordiska skogsbruket kommer att påverkas av EU:s ramverksdirektiv för vatten och hur skogsbruket kan bidra till att direktivet uppnås. Ett underlag som bör användas är svenska Skogsstyrelsens rapport i detta ämne som kommer den 31 mars 2010. Andra relevanta underlag kan komma från vattenmyndigheter och forskningsrapporter. Seminariet bör ha talare från skogsbruket, miljörelsen, myndigheter och kommissionen. En publikation om vad som togs upp och diskuterades ska tas fram. Den ska i första hand spridas till skogsbruket i Norden samt till de nordiska skogsministrarna.

Målgrupp: Skogsägarorganisation i den nordiska länderna.

Senaste datum: Andra halvan av 2011.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk i samarbete med Nordiska ämbetsmannakommittén för miljöfrågor.

Åtgärd 4

Aktivitet: Skrivbordsstudie och webbpublikation

Ämne: Att samla in och sprida forskningsresultat som är relevanta för Selfoss-deklarationen

Denna åtgärd berör punkterna 5 och 9 i Selfoss-deklarationen. Det har gjorts omfattande forskning i de nordiska länderna rörande de ämnen som tas upp i Selfoss-deklarationen. Under insamlingen av data för denna rapport gjordes en stor mängd pågående och slutförda studier tillgängliga från olika institutioner i de nordiska länderna. Denna aktivitet ska samla ihop sådan information och bygga en webbplats på SNS:s webb. Detta ska helst göras i samarbete med Östersjöstrategin och fokusera på både baltisk och nordisk information. Detta kan relatera till förslaget om ett pågående projekt från SNS, kallat "Uppbyggande av en nordisk-baltisk kunskapstjänst inom skog och skogsbruk".

Målgrupp: En bred publik, särskilt skogsvetare och de nordiska sektorerna för skogar och naturresurser.

Senaste datum: Så snart som möjligt.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk med partners SNS, EFINORD.

Föreslagen finansiering: SNS.

Åtgärd 5

Aktivitet: Främjande och publicering

Ämne: Att främja kunskap om och att informera om betydelsen av skogen för klimat och vatten

Denna åtgärd berör punkt 9 i Selfoss-deklarationen. Ad hoc-gruppen noterar att skogsbrukets roll när det gäller att begränsa klimatförändringar är mycket viktig och bör ligga högst upp på varje skogsorganisations informationsagenda. ”Skogar är överlägsna för koldioxidbindning och är en förnybar naturresurs som kan användas för alla sorters träprodukter och bioenergi.” Skogar är också mycket viktiga för hantering av sötvattensresurser. Detta kommer att publiceras i form av två lättillgängliga små broschyrer eller häften, en om skogar och klimat och en om skogar och sötvatten. Broschyerna ska kunna distribueras i ett relativt stort antal och ska finnas på alla nordiska språk. Befintlig information om åtgärder och praxis ska insamlas och användas.

Målgrupp: En bred publik, särskilt policyskapare och beslutsfattare inom miljö- och naturresurssektorerna.

Senaste datum: Så snart som möjligt.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk, i samarbete med SNS och NordGen Forest.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk.

Åtgärd 6

Aktivitet: Workshop

Ämne: Främja de nordiska skogarnas potential att begränsa klimatförändringar

Denna åtgärd berör punkt 3 i Selfoss-deklarationen. En workshop som undersöker de nordiska skogarnas potential att begränsa klimatförändringar. Det finns en stor potential för att begränsa klimatförändringar i de nordiska skogarna. Denna potential kan ökas betydligt, såväl inom befintliga skogar som genom att utöka skogsarealen och vidare genom att öka användandet av virke. Workshopen ska fokusera på potentialen att begränsa klimatförändringar i de nordiska skogarna och hur denna potential kan förbättras. Målsättningen är att inhämta och dela kunskap om de nordiska ländernas nyckelpolicies, erfarenheter och de viktigaste utmaningar när det gäller skogarnas möjlighet att begränsa klimatförändringar. Workshopen bör sikta på en publikation, helst ett Tema Nord-nummer. Resultaten kommer att vara relevanta för en bred publik i de nordiska länderna och även för kommunikation utanför Norden. De bör användas som bidrag till den föreslagna Forest day 5 vid UNFCCC COP 17-konferensen i Sydafrika år 2011.

Målgrupp: Detta bör vara en större nordisk workshop/konferens som samlar policyskapare för skogar, skogsmyndigheter, miljömyndigheter, forskare, skogsägare och nyckelaktörer från FN:s klimatförhandlingar i de nordiska länderna.

Senaste datum: Senast 2011

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk. I samröre med Nordiska ämbetsmannakommittén för miljöfrågor.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, respektive ordförandeskap, Nordiska ämbetsmannakommittén för miljöfrågor.

Åtgärd 7

Aktivitet: Skrivbordsstudie

Ämne: Analyser och publicering av strategier för skogsvård, för att begränsa klimatförändringar i de olika typer av skogar som finns i de nordiska länderna

Denna åtgärd berör punkt 3 i Selfoss-deklarationen. De nordiska länderna har implementerat en rad skogsstrategier och direkta åtgärder för att begränsa klimatförändringar. Denna aktivitet föreslår att SNS samlar in exempel från alla de nordiska länderna på strategier för skogsbruk och åtgärder som har vidtagits för att motverka klimatförändringar. Dessa exempel bör sikta på att representera strategier från olika ekologiska zoner för att motverka klimatförändringar. Detta ska publiceras av NMR och distribueras av respektive skogsmyndighet på en nationell nivå.

Målgrupp: Nationella skogsmyndigheter och skogsägare.

Senaste datum: Flexibelt.

Ansvar: SNS, delegerat till relevant CAR (Centre of Advanced Research).

Föreslagen finansiering: SNS.

Åtgärd 8

Aktivitet: Skrivbordsstudie

Ämne: Studier och rekommendationer om hur gemensamma europeiska riktlinjer för skogsplantering/återbeskogning kan appliceras i de nordiska länderna

Denna åtgärd berör punkt 3 i Selfoss-deklarationen. Det finns nyligen utgivna riktlinjer från FOREST EUROPE (tidigare MCPFE) för skogsodling/återbeskogning, med en särskild föreskrift för FN:s ramverkskonvention för klimatförändringar (UNFCCC). Riktlinjerna innefattar ett brett perspektiv och kan appliceras på alla länder i Europa. Man behöver därmed analysera relevansen av riktlinjerna för nordiskt skogsbruk, särskilt förenligheten med aktuella nordiska policys och praxis. Detta ska vara en skrivbordsstudie som undersöker förenligheten med FOREST EUROPE:s riktlinjerna för skogsodling/återbeskogning i de nordiska länderna och som ger mer riktade rekommendationer för de nordiska länderna.

Målgrupp: Nordiska skogsmyndigheter och tilläggstjänster.

Senaste datum: Flexibelt, men brådslande.

Ansvar: SNS implementerar. Lämpligt för en kvalificerad skogsbrukskonsult.

Föreslagen finansiering: SNS.

Åtgärd 9

Aktivitet: Nordisk workshop

Ämne: Workshop om hur nordiskt virke i permanenta konstruktioner kan marknadsföras

Denna åtgärd berör punkt 3 i Selfoss-deklarationen. Man kan uppnå en betydlig begränsning av klimatförändringar om det omedelbara utsläppet av CO₂ fördröjs genom att använda virke för permanenta strukturer. Denna workshop avser att underlätta användning av virke för permanenta konstruktioner. Den kommer att göra detta genom att understryka denna viktiga komponent av begränsning av klimatförändringar och utforska och dela nordiska erfarenheter.

Målgrupp: Representerar från träbearbetningsindustrin, skogsmyndigheter

Senaste datum: Flexibelt.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, det land som innehar ordförandeskapet.

Åtgärd 10

Aktivitet: Skrivbordsstudie

Ämne: Exempel på god praxis rörande återställning av skog i områden som inte har brukats på ett hållbart sätt.

Denna åtgärd berör punkt 8 i Selfoss-deklarationen. Denna aktivitet innefattar studier av exempel på god praxis om hur skogar kan användas för att återställa områden som inte har brukats på ett hållbart sätt. Detta ska inkludera både aktuella och historiska exempel och ska påkalla uppmärksamhet på det faktum att produktiva skogar som etableras på områden som inte har brukats på ett hållbart sätt kräver långsiktiga skötsel mål. I de nordiska länderna finns det en bred erfarenhet när det gäller att etablera skogar i eroderade och degraderade områden. Som exempel kan nämnas gamla danska planteringarna för att stävja sanddynor, Islands satsningar för att rehabilitera och återbeskoga eroderade områden samt insatser i flera nordiska länder för att återställa gruvområden och stenbrott.

Målgrupp: En vid krets från Norden, Europa och internationellt, inom områdena skogsbruk och återställning av landskap som inte har brukats på ett hållbart sätt.

Senaste datum: Flexibelt.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk initierar. SNS implementerar i samarbete med EFI. Det kan finnas intresse av att kommunicera detta med EU.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk och SNS.

Åtgärd 11

Aktivitet: Nordisk workshop

Ämne: Skyddsskogsbruk – Heklas skogar

Denna åtgärd berör punkt 8 i Selfoss-deklarationen. Skogar tillhandahåller en rad ekosystemtjänster såsom virkesproduktion och biologisk mångfald. Denna punkt fokuserar på de flertaliga miljöfördelarna med skogar som har

etablerats för skyddsändamål och hur sådana skogar även kan leverera materiella produkter. En workshop kommer att arrangeras, med fokus på skyddsskogsbruk, t.ex. skogar som har planterats för att skydda jord, skydda mot jordskred och kontrollera vind och vatten.

Målgrupp: En vid krets, inklusive nordiska myndigheter för skogsbruk, jordbruk, miljö och markanvändning.

Senaste datum: Flexibelt.

Ansvar: Workshop styrd av Nordiska ämbetsmannakommittén för skogsbruk och ÄK-Jordbruk med fokus på skogar och jord.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk och ÄK-Jordbruk.

Åtgärd 12, 13, 14
Introduktion

Allmän bakgrund och motivering för att öka insatserna inom hantering och bevarande av skogens genetiska resurser

Skogarnas genetiska mångfald spelar en viktig roll när det gäller att bevara skogarnas motståndskraft mot hot och att utnyttja olika möjligheter. En bred användning av denna genetiska mångfald ger även flexibilitet när det gäller skogsvård och anpassningsstrategier för klimatförändringar. Även om träd har en enastående förmåga att anpassa sig till klimatförändringar kan denna process ta lång tid och det är troligt att klimatförändringar kommer att ske så snabbt att träd inte har tid att genetiskt anpassa sig på ett naturligt sätt.

Två olika strategier kan användas för att snabba på anpassningen av träd till klimatförändringar: Forflytning, följt av främjande av lokal anpassning av potentiellt lämpligt reproduktivt material samt genom att förädla skogs-träd. Förädling använder den stora genetiska variationsförmågan hos trädar-ter för att producera reproduktiva material med en högre överlevnadschans, volym, kvalitetsproduktion och med en tillräckligt bred genetisk mångfald och som även har en potential för att utveckla reproduktiva material som är motståndskraftiga mot skadedjur och insekter. Inom detta fält finns det en uppenbar potential för samarbete, eftersom den nordiska regionen har stora likheter när det gäller klimatförhållanden. Man bör överväga att inkludera andra länder i Östersjöregionen i ett sådant samarbete.

Åtgärd 12
Aktivitet: Fälttester
Ämne: Utveckla reproduktiva material för framtida klimatförhållanden

Denna åtgärd berör punkt 6 i Selfoss-deklarationen. Etablera populationer av utvalda skogsträdsarter, särskilt bredbladiga, som i framtiden kan användas som frökällor, baserat på reproduktiva material från regioner med klimatförhållanden liknande förväntade förhållanden i regionen, för att säkra anpass-

ningsförmåga vid ändrade klimatförhållanden. Beslut bör fattas grundat på kunskaper från tidigare och pågående forsknings- och utvecklingsprogram.

Målgrupp: Nordiska skogsforskare.

Senaste datum: Flexibelt.

Ansvar: Lett av GENE CAR (SNS) och NordGen Skog i samarbete med relevanta nationella aktörer med ansvar för att tillhandahålla reproduktiva material.

Föreslagen finansiering: NordGen och SNS, EU (Östersjöstrategin).

Åtgärd 13

Aktivitet: Samarbete och utbyte

Ämne: Ökat samarbete inom nordisk skogsträdsförädling och förädlingsforskning.

Denna åtgärd berör punkt 6 i Selfoss-deklarationen. Etablera och underhålla ett nätverk med medlemmar från förädlings- och forskningsorganisationer, för att erhålla fördelaktigt samarbete inom förädling av gran och andra viktiga trädarter i de nordiska länderna. Säkerställa att förädlingen utförs på ett hållbart och vetenskapligt sunt sätt.

Målgrupp: Nordiska skogsgenetiker.

Senaste datum: Flexibelt.

Ansvar: NordGen Skog, GENE CAR (SNS) och nationella odlingsorganisationer.

Föreslagen finansiering: EU (Östersjöstrategin) och Nordiska ämbetsmannakommittén för skogsbruk.

Åtgärd 14

Aktivitet: Skrivbordsstudie

Ämne: Övervaka möjliga förändringar av den genetiska mångfalden av trädarter under skiftande klimatförhållanden

Denna åtgärd berör punkt 6 i Selfoss-deklarationen. Undersöka om det är möjligt att samla in fröpartier av populationer av valda skogsträdsarter, för att långtidslagra dem, t.ex. i Svalbard Global Seed Vault som referensmaterial för framtida genetiska studier. Studien bör använda nordiska trädarter som ett exempel, men framtida ambitioner inkluderar globala frömaterial.

Målgrupp: Nordiska skogsgenetiker och policyskapare.

Senaste datum: Så snart som möjligt.

Ansvar: CSO-Skogsbruk och NordGens styrelse, NordGen Skog.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk och NordGen.

Åtgärd 15

Aktivitet: Skrivbordsstudie

Ämne: Samla in exempel på hur bevarande av biologisk mångfald har integrerats i policy och praxis för skogar i de nordiska länderna

Denna åtgärd berör punkt 2 i Selfoss-deklarationen. Bra exempel från alla de nordiska länderna kommer att samlas in, om hur biologisk mångfald och skogsskötsel har koordinerats och om hur skogsskötsel kan utvecklas till nytta för fortsatt bevarande av biologisk mångfald. Resultat kommer att publiceras i en publikation med bilder som ska användas vid FOREST EUROPE-konferensen i Oslo år 2011 och (om möjligt) vid CBD COP 10 i oktober 2010.

Målgrupp: En vid krets innefattande forskare, skogs- och miljömyndigheter, skogsägarföreningar, skogsindustrin, miljö- och fritidsorganisationer.

Senaste datum: Flexibelt.

Ansvar: ÄK-Fiske, Jordbruk, Livsmedel och Skogsbruk.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, Nordiska ämbetsmannakommittén för miljöfrågor, finansiering från finansieringskällan ”Hållbar utveckling” (BU-puljen).

Åtgärd 16

Aktivitet: Skrivbordsstudie

Ämne: Betydelsen av dött och multnande virke för skogens biologiska mångfald

Denna åtgärd berör punkterna 1 och 2 i Selfoss-deklarationen. Förenta Nationerna utnämnde år 2010 som det internationella året för biologisk mångfald. En nyckelindikator för biologisk mångfald i skogar är död ved. Död ved är livsviktigt för en mängd organismer i en skogs ekosystem. Det finns en potentiell konflikt mellan att lämna död ved i skogarna till nytta för den biologiska mångfalden och för att öka användningen av skogens biomassa för energiändamål. Att välja den del av biomassan som kan infekteras av destruktiva skadedjur kan å andra sidan bidra till att förbättra skogens hälsa och skydda mångfalden.

Komplexiteten av detta problem beskrivs bäst genom att samla ihop erfarenheter och forskningsresultat om effekten av olika typer av död ved för skogens biologiska mångfald och genom att utveckla förslag till prioriteringar (storlek, art, fallet/stående) om vilken sorts död ved som bör lämnas i skogarna och i vilka områden (fuktighet, jord, m.m.) där det är särskilt viktigt för mångfalden att man lämnar död ved i skogarna. Erfarenheter kommer att samlas i elektronisk form och kommer att utgöra underlag för ett seminarium om att förbättra hållbar användning av biomassa från skogar (se aktivitet under Selfoss-deklarationen, sektion 1). Studien ska inkludera systematiska jämförelser mellan policys och åtgärder som finns/vidtas i de nordiska länderna som innefattar död ved i skogarna. Jämförelserna kommer att låta länderna dra nytta av sina kollektiva erfarenheter.

Målgrupp: Forskare, skogs- och miljömyndigheter, skogsägarföreningar, skogsindustrin, miljö- och fritidsorganisationer.

Senaste datum: Flexibelt.

Ansvar: SNS.

Föreslagen finansiering: SNS, finansiering från finansieringskällan "Hållbar utveckling" (BU-puljen) och "Working group on terrestrial nature" under Nordiska ämbetsmannakommittén för miljöfrågor

Åtgärd 17

Aktivitet: Skrivbordsstudie

Ämne: Riskbedömning av nya arter av skogsträd

Denna åtgärd berör punkterna 2, 3 och 6 i Selfoss-deklarationen. Globalt är invasiva arter nu ansedda att vara ett av de största hoten mot biologisk mångfald. Exempel på icke-nativa trädarter som anses ha blivit invasiva i skogar i Danmark inkluderar bergtall (*Pinus mugo*) och glanshägg (*Prunus serotina*). Dessa har identifierats som stora biologiska problem och betydliga resurser har lagts på att motarbeta den oönskade spridningen av dessa arter. Under växlande klimatförhållanden kommer det att finnas ett ökat intresse av att introducera nya trädarter, många av vilka förväntas trivas bra i varmare klimat och som kan användas i hållbart skogsbruk. Erfarenheter från andra länder eller regioner av hur introducerade arter kommer att prestera kommer att vara användbara när man introducerar nya arter i nordiska skogar.

Samla in information om erfarenheter av risker som förknippas med att introducera nya trädarter i skogsbruk. Erfarenheterna kommer att samlas in från länder eller regioner där klimatet och odlingsförhållandena kan anses vara liknande de nordiska länderna, från global uppvärmning.

Erfarenheterna kommer att innefattas i ett projekt såsom applicerat i Östersjöstrategin: "*Hantering och bevarande av de genetiska resurserna av skogsträd i regionen runt Östersjön under förändrade klimatförhållanden*".

Studien ska även innefatta en systematisk jämförelse mellan de nordiska länderna när det gäller policys och åtgärder som implementeras rörande icke-nativa trädarter, skogsbevarande och rollen av skogar i klimätförändringar. Ändamålet med denna jämförelse är att de nordiska länderna ska kunna dra nytta av sin kollektiva erfarenhet.

Målgrupp: Forskare, skogs- och miljömyndigheter, skogsägarföreningar, skogsindustrin, miljö- och fritidsorganisationer.

Senaste datum: Flexibelt.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk och NordGen Skog.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, Nordiska ämbetsmannakommittén för miljöfrågor, SNS och finansiering från finansieringskällan "Hållbar utveckling" (BU-puljen).

Åtgärd 18

Aktivitet: Riskanalyser och informationssystem

Ämne: Riskanalyser och etablering av ett system för att behandla potentiella patogener inom nordisk skogsvård som ett resultat av klimätförändringar

Denna åtgärd berör punkt 2 i Selfoss-deklarationen. Med ett förändrat klimat och möjligheten av nya trädarter och/eller av nya härkomster finns det en ökad risk för att nya skadedjur sprids i de nordiska skogarna. Det finns redan en ansvarig myndighet för att förhindra introduktion av skadliga arter av sjukdomar och insekter. Ett nordiskt varnings-/informationssystem för nya, *potentiellt* skadliga insekter och sjukdomar saknas. Möjligheter för att utveckla ett varningssystem för potentiella skadedjur i skogar kommer att studeras. Studien ska illustrera hur man bäst utvecklar ett sådant system och hur samt av vem som det ska hanteras och underhållas.

Målgrupp: Forskare, skogs- och miljömyndigheter, skogsägarföreningar, skogsindustrin, miljö- och fritidsorganisationer.

Senaste datum: Flexibelt.

Ansvar: PATHCAR tillsammans med entomologer.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, Nordiska ämbetsmannakommittén för miljöfrågor, SNS och finansiering från finansieringskällan ”Hållbar utveckling” (BU-puljen).

Åtgärd 19

Aktivitet: Skrivbordsstudie

Ämne: Samla in och analysera exempel på skogsodling/planteringsprojekt i de nordiska länderna där förmånerna från utsläppskrediter har varit den drivande kraften.

Denna åtgärd berör punkterna 2, 3 och 7 i Selfoss-deklarationen. Skogsodling, grundvatten och koldioxidbindning. Skogsodling i peri-urbana områden är särskilt lämpligt för att säkerställa renare grundvatten, medan den nya skogen kan ge andra förmåner till städer och deras innevånare. Privata markägare, industri, m.fl. kan vidare motiveras att engagera sig i skogsodlingsprojekt, om de kan få utsläppskrediter för den CO₂ som binds av den nya skogen. En analys kommer att beredas, grundat på insamlingen av bra exempel på hur Kyotoprotokollets kvotsystem kan användas för att främja skogsodling.

Målgrupp: Forskare, skogs- och miljömyndigheter, skogsägarföreningar, skogsindustrin, miljö- och fritidsorganisationer.

Senaste datum: Flexibelt.

Ansvar: CAR-ES (eller dess efterföljare).

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, SNS, Nordiska ämbetsmannakommittén för miljöfrågor (arbetsgruppen ”kol och luft”).

Åtgärd 20

Aktivitet: Konferens

Ämne: Lokal och regional betydelse av de nordiska skogarna

Denna åtgärd berör punkt 7 i Selfoss-deklarationen. En konferens som fokuserar på den lokala och regionala betydelsen av nordiska skogar. Det kan vara svårt att kvantifiera värdet av de olika dimensionerna av hållbarhet. Det är enklast att kvantifiera ekonomisk tillväxt, medan värden för sociologisk

utveckling och miljöskydd är svårare att mäta. Sedan Nødebo-deklarationen 2005 har en arbetsgrupp under det nordiska ministerrådet arbetat med att stärka dialogen om skogars lokal värde och hur man kan tydliggöra detta värde för myndigheter och för allmänheten. Arbetet med ”Skogens lokala värde” under det nordiska ministerrådet är en kontinuerlig process. Bland de projekt som är relaterade till detta ämne är en konferens som Island var värd för 2009, *Forestry serving urban societies in the North Atlantic Region*.

Målgrupp: En vid krets innefattande forskare, skogs- och miljömyndigheter, skogsägarföreningar, skogsindustrin, miljö- och fritidsorganisationer och lokala myndigheter.

Senaste datum: 2011/Flexibelt.

Ansvar: Nordiska ämbetsmannakommittén för skogsbruk.

Föreslagen finansiering: Nordiska ämbetsmannakommittén för skogsbruk, ÄK-Livs, finansiering av NMR-Ordförandeskapet och finansiering från finansieringskällan ”Hållbar utveckling”.