

# Final Report (2005-2010)

## Centre of Advanced Research on Environmental Services (CAR-ES)



### People active in CAR-ES 2005-2010 (core group in italics)

Denmark Forest & Landscape Denmark	Sweden Skogforsk (and SLU)	Iceland Icelandic Forest Research Agric. Univ. of Iceland
<ul style="list-style-type: none"> <li>- <i>Per Gundersen</i> (co-ordinator)</li> <li>- <i>Karin Hansen</i> (secretary)</li> <li>- Morten Ingerslev</li> <li>- Inge Stupak Møller</li> <li>- Karsten Raulund Rasmussen</li> <li>- Ingeborg Callesen</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Jan-Olav Weslien</i></li> <li>- <i>Eva Ring</i></li> <li>- <i>Lars Högbom</i></li> <li>- Staffan Jacobson</li> <li>- Olof Widenfalk</li> <li>- Ulf Sikström</li> <li>- Martyn Futter</li> <li>- Stefan Löfgren</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Bjarni D. Sigurdsson</i></li> <li>- Brynhildur Bjarnadóttir</li> <li>- Jón Ágúst Jónsson</li> <li>- Edda S. Oddsdóttir</li> <li>- Helena Marta Stefánsdóttir</li> <li>- Gintare Medelyte</li> </ul>
Norway Skog og Landskab	Finland METLA	Latvia and Lithuania Silava Lithuanian For. Res. Inst.
<ul style="list-style-type: none"> <li>- <i>Magne Sætersdal</i></li> <li>- <i>Dan Aamlid</i></li> <li>- Kjersti Holt Hanssen</li> <li>- Nicholas Clarke</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Leena Finér</i></li> <li>- <i>Ari Laurén</i></li> <li>- Hannu Ilvesniemi</li> <li>- Jukka Laine</li> <li>- Anna Tolvanen</li> <li>- <i>Harri Koivusalo</i></li> <li>- Heljä-Sisko Helmisaari</li> <li>- Sakari Sarkkola</li> <li>- Riitta Väänänen</li> <li>- Sirpa Piirainen</li> <li>- Marjo Palviainen</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Andis Lazdins</i></li> <li>- <i>Dagnija Lazdina</i></li> <li>- Aigars Indriksons</li> <li>- Andis Bardulis</li> <li>- <i>Jurate Aleinikoviene</i></li> <li>- Kestutis Armolaitis</li> <li>- Iveta Varangiryte</li> </ul>

### ***Objectives (summary from application)***

In this Nordic centre, Environmental Services (ES) include i) C-sequestration, ii) water protection and iii) biodiversity.

With the general objective to strengthen Nordic collaboration and research innovation the specific objectives of CAR-ES are:

- To strengthen the knowledge base for counting and optimising environmental services in sustainable forest management (SFM).
- To quantify the environmental impact of different management strategies and practices in operational ways, that can support decision-making.
- To improve the knowledge and visibility of the environmental services provided by forests in the public as well as among forest owners and managers.

The ambition is to integrate and synthesise the knowledge base (conceptually, qualitatively and quantitatively) on environmental services to the level needed for developing a decision support system (DSS) for SFM. This knowledge base for a DSS may then be implemented by the partners in their internet based dissemination platforms that may target forest owners, decision-makers as well as the general public.

It is not the aim to perform detailed research within each of these three vast research topics. The aim is to focus on the interactions and the major gaps in knowledge from *a holistic view* where information can be integrated across the topics.

#### *Direct operational aims*

- Coordination of Nordic research in the area; eliminate potential overlap and promote effective use of Nordic R&D resources.
- Synergy among the three environmental services in research as well as in practice

### ***Status and results for 2005-2010***

The following **major scientific achievements and products** have been brought about during the CAR-ES first project period from 2005-2010:

**International conference:** "Adapting Forest Management to Maintain the Environmental Services: Carbon Sequestration, Biodiversity and Water", 21-24 Sept. 2009, Koli, Finland (Finér et al.). The CAR-ES concept and results were presented in 4 oral and 6 poster contributions and well received by the c. 55 participants.

**A review on the importance of riparian forests** and their use as buffers ("*Environmental Services Provided from Riparian Forests in the Nordic Countries*") published in AMBIO (Gundersen et al. 2010) includes research and management recommendations.

**Three proposals for SNS projects, three funded:** i) "Environmental impact of shorter forest rotations" (SNS 102) was completed with a scientific publication (Weslien et al. 2009) and communicated to forestry (Weslien et al. 2008); ii) "Ash recycling - long-term effects on tree growth" (SNS 106) still running; iii) "Leaching of carbon, nitrogen and phosphorous from forest land in the Nordic and Baltic countries" (SNS-110) starting in 2011.

**Communication on "Forest and water"** issues at the Nordic Council of Ministers Selfoss meeting in an oral presentation by E. Ring as well as in a fact-sheet printed and available on the SNS website.

**Two seminars or workshops per year** rotating between all the Nordic countries and Latvia. Each seminar had a different focus, where researchers from all the countries gave presentations. Field visits sharing experimental experiences and results were an integrated part of the seminars with a few work meetings as exceptions. The seminars recruited new participants thus the network has grown steadily and has become a successful venue for new research ideas and dissemination of new knowledge (see below).

The national groups all together produce **>20 peer reviewed papers per year**.

**Bilateral cooperation initiated** on several issues e.g. SE and FI had joint activities related to consequences of bioenergy production; NO and IS shared information important for the dispersal of lichens; DK and SE worked on two review studies arising from work reports in the EU EFORWOOD project.

**A meta-database** initiated on observations/experiments related to water quality (Högbom et al.) and N, P and DOC leaching as a result of different forest management operations in order to know the state of the overall amount of available data in the Nordic and Baltic countries (basis for project SNS-110).

A **Web-page** ([www.nordicforestry-cares.org](http://www.nordicforestry-cares.org)) was maintained.

**CAR-ES phase II proposal** produced to SNS and a new grant obtained for 2011-2015.

### ***Project seminars and conferences held 2005-2010***

*September 29-30, 2005, Hørsholm, Denmark*

Kick-off meeting to discuss the basic idea of the CAR and reach a common understanding of the project. 11 scientists from 7 countries participated.

*May 18-19, 2006, Hyytiälä, Finland*

Open seminar on 'Buffer zones and ecosystem services'. 10 scientists from 5 countries participated.

*October 12-15, 2006, Haukadalur, Iceland*

Open seminar on 'Effects of afforestation on ecosystem services'. 12 scientists from 5 countries participated.

*June 7-9, 2007, Bergen, Norway.*

Open seminar on 'Biodiversity'. 14 scientists from 5 countries participated.

*January 10-12, 2008, Frederiksberg, Denmark*

Open seminar on 'Water and Climate Change'. 14 scientists from 6 countries participated.

*May 27-29, 2008, Norberg, Sweden.*

Open seminar on 'Bioenergy and its consequences for Environmental Services'. 19 scientists from 6 countries participated.

*October 29-30, 2008, Helsinki, Finland.*

Planning seminar for international conference. 11 scientists from 5 countries participated.

*June 2-5, 2009, Akureyri, Iceland*

Open seminar on 'Environmental Services of forests and terrestrial-aquatic interactions'. 17 scientists from 6 countries participated.

*September 21-24, 2009, Koli, Finland*

International conference "Adapting Forest Management to Maintain the Environmental Services: Carbon Sequestration, Biodiversity and Water". 55 scientists participated.

*March 16-18, 2010, Jaunmoku Palace, Latvia*

Open seminar focussing on "Bioenergy". 15 scientists from 6 countries participated.

*September 28-30, 2010, Söderåsen, Sweden*

Open seminar on 'N and P leaching from forests in the Nordic region". 14 scientists and 2 students from 7 countries participated.



*June 2-5, 2009, Akureyri, Iceland*

### ***Use of funds and overall turnaround 2005-2010***

Over the six year period CAR-ES received and used c. 350.000 Euro from SNS (recently 62.000 EUR/yr) and the partner institute used a similar amount for activities directly related to the CAR-ES (approximately half own funds and half other supporting funds). The total turnaround in R&D projects on or supporting Environmental Services at the partner institutes is estimated to 3.9 mill EUR/yr (2010) and thus the SNS funds is less than 2% of the R&D in the research area coordinated by the network.

### ***Publications 2005-2010***

The full accumulated list of publications generated by the core network during the project period 2005-2010 is attached (Annex 1). The list has two parts first showing those publications directly produced based on the funding of CAR-ES and secondly those generated by the network.