



norden

Nordic Forest Research  
Cooperation Committee - SNS

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Project no: SNS-94

## STATUS REPORT PROJEKT (Total project + economics for 2006 and 2007)

Please notice that the size of text sections in the form can be adjusted if needed.

1. Projektittel	Estimering af kulstofflagring i skovens biomasse i de nordiske og baltiske lande - fælles metoder, metodebeskrivelse samt redskaber til bestemmelse af sammenlignelige biomasse ekspansionsfunktioner (BEF)
2. Project title	Estimation of carbon storage in forest biomass in the Nordic and Baltic countries - common methods, protocol and tools for obtaining comparable biomass expansion functions (BEF)
3. Project leader /coordinator (name, address, telephone, fax, e- mail)	Dr. Senior Scientist Karin Hansen <i>Forest &amp; Landscape Denmark</i> University of Copenhagen Department of Applied Ecology Hoersholm Kongevej 11 DK-2970 Hoersholm Phone: +45 35331682 or +46 8 7678580 Fax: +45 35331517 E-mail: <a href="mailto:kiha@life.ku.dk">kiha@life.ku.dk</a>
4. Contact person in the other participating countries	Malle Mandre, IFRE-EAU, Estonia Helja-Sisko Helmisaari, METLA, Finland Bjarni Sigurdsson, MÖGILISÁ, Iceland Talis Gaitnieks, SILAVA, Latvia Kestutis Armolaitis, LFRI, Lithuania Petter Nilsen, Skogforsk, Norway Jon Frank, UMB, Norway Lars Högbom, Skogforsk, Sweden Sune Linder, SLU, Sweden

<p>4. Time schedule</p>	<p>Project start has been moved forward to August 1<sup>st</sup> 2004 with finalisation of the project July 31<sup>st</sup> 2007 according to earlier letter.</p> <p>Project start    01/08 2004  Project end    31/07 2007  Final reporting date                                    31/10 2007</p>
<p>5. Status of progress (mark with x)</p>	<p><input checked="" type="checkbox"/> The project was carried out according to the project plan</p> <p><input type="checkbox"/> The project in not carried out according to the project plan (please describe discrepancies briefly below)</p>

<p>6. Activities carried out in the project period</p>	<p><b><i>The aims of this study have been to:</i></b></p> <ol style="list-style-type: none"> <li>1) give an overview of how data on biomass distribution of Norway spruce from national forest inventories and other easily accessible sources are used and potentially can be used in the national Land Use, Land Use Change, and Forestry (LULUCF) reporting.</li> <li>2) synthesise available knowledge on expansion factors and functions, starting with Norway spruce, with special attention to the root fraction.</li> <li>3) utilise existing data and results of other project results for investigation, development, and comparison of expansion factors and functions in the Nordic and Baltic countries (cf. "Data basis" below).</li> <li>4) develop a PC-tool for estimation of carbon stand biomass in Norway spruce, thereby making results operational.</li> <li>5) use the developed tool to identify, quantify, and illustrate the major errors and uncertainties in biomass carbon budgets, especially those originating from uncertainties in the biomass expansion functions.</li> </ol> <p><b><i>Activities carried out during the project period:</i></b></p> <p>Country reports on ongoing activities and methods used in connection to the LULUCF/AFOLU reporting, especially with regard to biomass expansion factors (BEF) and available data on both below-ground and above-ground biomass have been produced. These country reports offer an overview of applied carbon reporting methods and available input data for the Nordic and Baltic countries (Ad. 1 and 2). Based on the country reports, we compiled information on available data sets for country-specific Norway spruce BEFs and on current activities or projects to support or improve LULUCF/AFOLU reporting with regard to biomass quantification for Norway spruce.</p> <p>A new model, FORCAREST, has been developed in a second version. The model is attached to this report. With the model it will be possible to compare results when different calculation methods are applied to estimate carbon stocks in stand biomass in selected Norway spruce example stands (Ad. 4 and 3). Norway spruce example stands were selected from different countries and incorporated in the model. The example stands are typical for both Nordic and Baltic conditions. The first version of the model was discussed thoroughly at a project meeting at Nødebo, Denmark at the 27<sup>th</sup>-28<sup>th</sup> of April 2007. A third version of the model will be developed based on national funding in the coming ½ a year.</p> <p>An international paper describing the model has been sketched during the project period: "Stupak et al. (2008). Estimation of net carbon stocks in biomass of Norway spruce in the Nordic and Baltic countries – comparison of calculation methods using the model FORCAREST. Manuscript to Biomass and Bioenergy (in prep.)". The outline of the paper is attached. In the coming ½ year this paper will be finished as a co-operation between all project partners. In the paper, the methods presently applied within the Nordic and Baltic countries will be compared (Ad. 3) and planned future developments in methodology in the region will be outlined. Further steps towards harmonisation of methods will be suggested as well as possibilities for knowledge transfer in the Nordic/Baltic region will be pointed out. Also, the major errors and uncertainties in biomass carbon budgets will be identified and illustrated (Ad. 5). Several other international articles concerning the topics of this project has been produced partly financed by this project (see publication list in 8).</p>
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<p>7. Main results in the project period</p>	<p>8 country reports giving an overview of each countrys methods used in the LULUCF reporting on biomass C stocks, especially with regard to biomass expansion functions (BEFs) and available data on below- and aboveground biomass (Reports can be forwarded if needed).</p> <p>Syntheses of available data sets as background for country-specific Norway spruce BEFs and of current activities or projects to support or improve LULUCF reporting in the Nordic and Baltic countries (Syntheses can be forwarded if needed).</p> <p>A new model FORCAREST ready in its second edition (attached to this report).</p> <p>One international paper in preparation (outline attached to this report) and contribution to several other papers (see literature list in 8).</p>
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<p>8. Publications/main information activities carried out in the years of reporting</p>	<p>Berggren Kleja, D., Svensson, M., Majdi, H., Jansson, P.-E., Langvall, O., Bergkvist, B., Johansson, M.-B., Weslien, P., Truus, L., Lindroth, A. &amp; Ågren, G.I. 2007. Pools and fluxes of carbon in three Norway spruce ecosystems along a climatic gradient in Sweden. <i>Biogeochemistry</i>, doi 10.1007/s10533-007-9136-9 Published on line</p> <p>Bergh, J., Linder, S. &amp; Bergström, J. 2005. Potential production for Norway spruce in Sweden. <i>Forest Ecology and Management</i> 204, 1-10.</p> <p>Bjarnadóttir, B., Sigurdsson, B.D. &amp; Lindroth, A. 2007. Estimate of annual carbon balance of a young Siberian larch (<i>Larix sibirica</i>) plantation in Iceland. <i>Tellus B</i> (submitted).</p> <p>Einarsson, S.F., Sigurdsson, B.D. &amp; Snorrason, A. 2004. Estimating aboveground biomass for Norway spruce (<i>Picea abies</i>) in Iceland. <i>Icelandic Agricultural Sciences</i> 16-17, 53-63.</p> <p>Helmisaari, H-S., Derome, J., Nöjd, P., Kukkola, M. 2007. Fine root biomass in relation to site and stand characteristics in Norway spruce and Scots pine stands. <i>Tree Physiology</i> 27, 1493-1504.</p> <p>Hyvönen, R., Persson, T., Andersson, S., Olsson, B., Ågren, G.I. &amp; Linder, S. 2007. Impact of long-term nitrogen addition on carbon stocks in trees and soils in northern Europe. <i>Biogeochemistry</i> doi: 10.1007/s10533-007-9121-3. Published on line.</p> <p>Hyvönen, R., Ågren, G.I., Linder, S., Persson, T., Cotrufo, M.F., Ekblad, A., Freeman, M., Grelle, A., Janssens, I.A., Jarvis, P.G., Kellomäki, S., Lindroth, A., Loustau, D., Lundmark, T., Norby, R.J., Oren, R., Pilegaard, K., Ryan, M.G., Sigurdsson, B.D., Strömgren, M., van Oijen, M. &amp; Wallin, G. 2007. The likely impact of elevated [CO<sub>2</sub>], nitrogen deposition, increased temperature and management on carbon sequestration in temperate and boreal forest ecosystems: a literature review. <i>New Phytologist</i> 173, 463-480.</p> <p>Iivonen, S., Kaakinen, S., Jolkonen, A., Vapaavuori, E. &amp; Linder, S. 2006. Influence of long-term nutrient optimisation on biomass, carbon and nitrogen acquisition and allocation in Norway spruce. <i>Canadian Journal of Forest Research</i> 36: 1563-1571.</p> <p>Inghammar, A.C., Brinker, M.-M., Bjarnadóttir, B., Sigurdsson, B.D. 2007. Biomass and volume equations for young Siberian larch trees (<i>Larix sibirica</i> Ledeb.). <i>Icelandic Agricultural Sciences</i> 20, xx-xx. (submitted).</p> <p>Jarvis, P.G. &amp; Linder, S. 2007. Forests remove carbon dioxide from the atmosphere: spruce forest tales! In: Freer-Smith, P., Broadmeadow, M. &amp; Lurch, J. (eds.) <i>Forestry and Climate Change</i>, pp. 60-72. CABI Publishing, Wallingford, UK.</p> <p>Jarvis, P.G., Ibrom, A., &amp; Linder, S. 2005. Carbon forestry - Managing forests to conserve carbon. In: Griffiths, H. &amp; Jarvis, P.G. (eds) <i>The Carbon Balance of Forest Biomes</i>, pp. 331-349. Taylor &amp; Francis Group, U.K. ISBN 1-8599-6214-9.</p> <p>Kaakinen, S., Lehtonen, A., Lappi, J., Kukkola, M., Helmisaari, H-S. &amp; Vapaavuori, E. 2007. Allometric relationships of Norway spruce in long-term fertilisation experiments in northern and southern Finland (submitted).</p> <p>To be continued....</p>
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<p>8. Publications/main information activities carried out in the year of reporting - ....continued</p>	<p>Lindroth, A., Lagergren, F., Aurela, M., Bjarnadottir, B., Christensen, T., Dellwik, E., Grelle, A., Ibrom, A., Johansson, T., Lankreijer, H., Launiainen, S., Laurila, T., Mølder, M., Nikinmaa, E., Pilegaard, K., Sigurdsson, B.D. &amp; Vesala, T. 2007. Leaf area index is the principal scaling parameter for both gross photosynthesis and ecosystem respiration of northern deciduous and coniferous forests. <i>Tellus B</i> (submitted).</p> <p>Majdi, H. &amp; Andersson, P. 2005. Fine root production and turnover in a Norway spruce stand in northern Sweden: effects of nitrogen and water manipulation. <i>Ecosystems</i> 8, 191-199.</p> <p>Majdi, H., Nylund, J.E. &amp; Ågren, G.I. 2007. Root respiration data and minirhizotron observations conflict with root turnover estimates from sequential soil coring. <i>Scandinavian Journal of Forest Research</i> 22, 299 – 303.</p> <p>Medlyn, B.E., Berbigier, P., Clement, R., Grelle, A., Loustau, D., Linder, S., Wingate, L., Jarvis, P.G., Sigurdsson, B.D &amp; McMurtrie, R.E. 2005. Carbon balance of coniferous forests growing in contrasting climates: Model-based analysis. <i>Agricultural and Forest Meteorology</i> 131, 97-124.</p> <p>Nilsen, P. &amp; Strand, L.T. 2007. Thinning intensity effects on carbon and nitrogen stores and fluxes in a Norway spruce (<i>Picea abies</i> (L.) Karst.) stand after 30 years (submitted to <i>Forest Ecology</i>).</p> <p>Nilsen, P. &amp; Strand, L.T. 2007. Carbon stores and C efflux in even-aged and uneven-aged Norway spruce forest. (in prep.)</p> <p>Rosberg, I., Frank, J. &amp; Stuanes, A.O. 2006. Effects of liming and fertilization on tree growth and nutrient cycling in a Scots pine ecosystem in Norway. <i>Forest Ecology and Management</i> 237, 191-207.</p> <p>Sigurdsson, B.D., Magnusson, B., Elmarsdottir, A. &amp; Bjarnadottir, B. 2005. Biomass and composition of understory vegetation and the forest floor carbon stock across Siberian larch and mountain birch chronosequences in Iceland. <i>Annals of Forest Science</i> 62 (8), 881-888.</p> <p>Skovsgaard, J.P., Stupak, I. &amp; Vesterdal, L. 2006. Distribution of biomass and carbon in even-aged stands of Norway spruce (<i>Picea abies</i> (L.) Karst.): A case study on spacing and thinning effects in northern Denmark. <i>Scandinavian Journal of Forest Research</i> 21, 470-488.</p> <p>Suñrason, A. &amp; Einarsson, S.F. 2006. Single-tree biomass and stem volume functions for eleven tree species used in Icelandic forestry. <i>Icelandic Agricultural Sciences</i> 19, 15-24.</p> <p>Stupak, I. et al. 2008. Estimation of net carbon stocks in living biomass of Norway spruce in the Nordic and Baltic countries – comparison of reporting methods using the model FORCAREST. Manuscript to <i>Biomass and Bioenergy</i> (in prep.).</p> <p>Ågren, G.I., Hyvönen, R. &amp; Nilsson, T. 2007. Are Swedish forest soils sinks or sources for CO<sub>2</sub>-model analyses based on forest inventory data. <i>Biogeochemistry</i> DOI 10.1007/s10533-006-9064-0.</p>
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<p>9. Economic reporting 2006+7 (NOK)</p>	<table border="0"> <tr> <td><b>Use of funds (NOK):</b></td> <td>SNS-funds transferred from 2005</td> <td>389.904</td> </tr> <tr> <td>SNS funds.....</td> <td>SNS-grant 2006+7*</td> <td>449.239</td> </tr> <tr> <td>Own funds ...</td> <td>Available SNS-funds 2006+7 .....</td> <td>839.143</td> </tr> <tr> <td>Other funds.....</td> <td><b>Specific use of SNS funds (NOK):</b></td> <td></td> </tr> <tr> <td>Sum funds ...</td> <td>Salary incl. social costs .....</td> <td>777.047</td> </tr> <tr> <td></td> <td>Travel cost .....</td> <td>37.798</td> </tr> <tr> <td>Share of SNS-financing: 35%</td> <td>Materials .....</td> <td>111.040</td> </tr> <tr> <td></td> <td>Other cost .....</td> <td>71.521</td> </tr> <tr> <td></td> <td>Sum cost .....</td> <td>997.406</td> </tr> <tr> <td></td> <td>Non-used SNS funds 2006+7</td> <td>0</td> </tr> </table> <p><i>* smaller value than given from SNS because of currency exchange rates</i></p>	<b>Use of funds (NOK):</b>	SNS-funds transferred from 2005	389.904	SNS funds.....	SNS-grant 2006+7*	449.239	Own funds ...	Available SNS-funds 2006+7 .....	839.143	Other funds.....	<b>Specific use of SNS funds (NOK):</b>		Sum funds ...	Salary incl. social costs .....	777.047		Travel cost .....	37.798	Share of SNS-financing: 35%	Materials .....	111.040		Other cost .....	71.521		Sum cost .....	997.406		Non-used SNS funds 2006+7	0
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<p>Date October 31<sup>st</sup> 2007</p>	<p>Signature of project leader/coordinator</p> <p>Dr. Karin Hansen</p> 																														