

Annual report for SNS Centre of Advanced Research (CAR)

Submit the annual report to sns@slu.se by 24:00 CET, 1st of March at the latest.
 The report should not exceed 2000 words (including words in the template).

Please adjust the box size according to the length of your answer.

1. Project title:	Centre of Advanced Research on Environmental Services from Nordic Forest Ecosystems (CAR-ES)
2. Reporting year:	2018

3. Project coordinator:	Raija Laiho
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Activities during the reporting year:

4. Project status

- Does the project develop according to the plans?
- Describe the activities during the reporting year.

a) The operational aims for the networking within CAR-ES have been set to:

- Provide a platform for interdisciplinary communication in Nordic and Baltic countries
- Integrate and share knowledge on ES
- Coordinate research, i.e. reduce overlap, improve the comparability of complementary national research, and contribute to national research agenda
- Share scientific tools, methodologies and data
- Identify hot issues requiring urgent scientific response, and initiate new research projects at the Nordic-Baltic scale, and/or at the European scale with a strong Nordic-Baltic component.

These aims have been followed, and the project develops generally according to the original work plan.

b) CAR-ES activities are based on active national research and dissemination, including training of forestry professionals. Varying consortia of CAR-ES members are also active in several international projects including EU COST actions. CAR-ES has proven integral for forming consortia with a strong Nordic-Baltic perspective, and benefits for the region. The progress of all research is reported in the network meetings, where joint interests are identified and coordinated efforts are initiated. The meetings are thus integral for CAR-ES, even though much of the communication in general takes place via e-mail.

Main activities in the topic areas covered by CAR-ES included:

C sequestration: collaboration was largely channeled through the SNS-120 project on greenhouse gas emissions from organic forest soils, which is a spin-off of CAR-ES (reported separately). Related national research was done actively, e.g., in projects "SOMPA" (Finland), and "WETWOOD" (Iceland). Further, NIBIO (coordinator), Silava, and University of Copenhagen participated in ERA-GAS project "Improving national forest inventory-based carbon stock change estimates for greenhouse gas inventories (INVENT)" together with Swedish University of Agricultural Sciences.

Functional biodiversity: Mapping of the state-of-the-art in the Nordic-Baltic region based on a questionnaire continued.

Water quality: Much of the collaboration was channeled through the Interreg project "WAMBAAF", which is a spin-off of CAR-ES (<https://www.skogsstyrelsen.se/en/wambaf/>). The project aims to reduce nutrient and mercury export from forestry to streams, lakes and the Baltic Sea. Main emphasis is on knowledge transfer and development of toolboxes with planning tools, films and good practices. Several training events were organized in different countries.

Soil quality: Collaboration on an evaluation for harmonizing and standardizing methods for soil texture analysis continued. One publication was finished (in a 2019 volume of the journal, so reported next year), and another one is being prepared.

Silvicultural operations: national-level research on forest management on sensitive soils that will be basis for future synthesis was done in several countries. There is a clear link to the work carried out within NB Nord, with whom we had a joint workshop.

Intensified harvesting: Work was continued to finalize a meta-analysis on effects of intensified biomass harvesting on soil conditions (C and nutrient contents as well as acidity). A major activity was to organize an international conference together with SNS-NKJ 03 "Effects of bioenergy production from forests and agriculture on ecosystem services in Nordic and Baltic landscapes", which is a spin-off of CAR-ES, and IAEA Bioenergy Task 43 (see section 6). Related papers are being compiled. CAR-ES partners also contributed to planning of the international IEA Bioenergy Task 43 workshop "Adequacy of Spatial Databases for Conducting Risk Assessments of Sustainable Wood Sourcing Practices of the U.S. Industrial Wood Pellet Industry Supplying European Energy Demand" to be organized in Athens, GA, USA, 1-3 May, 2019.

Land-use change involving forests: national-level research that will be basis for future synthesis was done in several countries. Within the national Danish project "SINKS2", a subproject was initiated between Denmark (UCPH) and Norway (NIBIO) to simulate SOC stocks after LUC. Cooperation between Lithuania and Denmark regarding data evaluation and publication of a national LUC study was initiated.

Climate change: collaboration was mostly channeled through ES-1308 COST "ClimMani", and a joint project "ForHot" in Iceland. This collaboration has now resulted in a new H2020 project, "FutureArctic" (2019-2023), where a number of participants are involved.

5. List the published outputs during the reporting year (peer-reviewed articles, other publications):

Peer-reviewed articles, CAR-ES quoted in Acknowledgements:

- Holmstrup M, Ehlers BK, Slotsbo S, Ilieva-Makulec K, Sigurdsson BD, Leblans NIW, Eilers J, Berg MP (2018) Functional diversity of Collembola is reduced in soils subjected to short-term, but not long-term, geothermal warming. *Functional Ecology* 32: 1304–1316. DOI: [10.1111/1365-2435.13058](https://doi.org/10.1111/1365-2435.13058)
- Maljanen M, Bhattarai HR, Biasi C, Sigurdsson BD (2018) The effect of geothermal soil warming on the production of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), nitric oxide (NO) and nitrous acid (HONO) from forest soil in southern Iceland. *Icelandic Agricultural Sciences* 31: 11-22. DOI: [10.16886/IAS.2018.02](https://doi.org/10.16886/IAS.2018.02)
- Marañón-Jiménez S, Soong JL, Leblans NIW, Sigurdsson BD, Peñuelas J, Richter A, Asensio D, Fransen E, Janssens IA (2018) Geothermally warmed soils reveal persistent increases in the respiratory costs of soil microbes contributing to substantial C losses. *Biogeochemistry* 138: 245–260. DOI: [10.1007/s10533-018-0443-0](https://doi.org/10.1007/s10533-018-0443-0)
- Parts K, Tedersoo L, Schindlbacher A, Sigurdsson BD, Leblans NIW, Oddsdottir ES, Borcken W, Ostonen I (2018) Acclimation of fine root systems to soil warming: comparison of an experimental setup and a natural soil temperature gradient. *Ecosystems*. DOI: [10.1007/s10021-018-0280-y](https://doi.org/10.1007/s10021-018-0280-y)

Other peer-reviewed publications contributing to CAR-ES work (selection):

- Aleinikovas M, Jasinevičius G, Škėma M, Beniušienė L, Šilinskis B, Varnagiryte-Kabašinskienė I (2018) Assessing the Effects of Accounting Methods for Carbon Storage in Harvested Wood Products on the National Carbon Budget of Lithuania. *Forests* 9 (12): 737. DOI: [10.3390/f9120737](https://doi.org/10.3390/f9120737)
- Armolaitis K, Stakėnas V, Varnagiryte-Kabašinskienė I, Gudauskienė A, Žemaitis P (2018). Leaching of Organic Carbon and Plant Nutrients at Clear Cutting of Scots Pine Stand on Arenosol. *Baltic Forestry* 24: 50–59.
- Becker H, Aosaar J, Varik M, Morozov G, Aun K, Mander Ü, Soosaar K, Uri V (2018) Annual net nitrogen mineralization and litter flux in well-drained downy birch, Norway spruce and Scots pine forest ecosystems. *Silva Fennica* vol. 52 no. 4 article id 10013. 18 p. DOI: [10.14214/sf.10013](https://doi.org/10.14214/sf.10013)
- Callesen I, Keck H, Andersen TJ (2018) Particle size distribution in soils and marine sediments by laser diffraction using Malvern Mastersizer 2000 — method uncertainty including the effect of hydrogen peroxide pretreatment. *Journal of Soils and Sediments* 18: 2500–2510. DOI: [10.1007/s11368-018-1965-8](https://doi.org/10.1007/s11368-018-1965-8)
- Nieminen M, Hökkä H, Laiho R, Juutinen A, Ahtikoski A, Pearson M, Kojola S, Sarkkola S, Launiainen S, Valkonen S, Penttilä T, Lohila A, Saarinen M, Haahti K, Mäkipää R, Miettinen J, Ollikainen M (2018) Could continuous cover forestry be an economically and environmentally feasible management option on drained boreal peatlands? *Forest Ecology and Management* 424: 78–84. DOI: [10.1016/j.foreco.2018.04.046](https://doi.org/10.1016/j.foreco.2018.04.046)
- Haahti K, Nieminen M, Finér L, Marttila H, Kokkonen T, Leinonen A, Koivusalo H (2018) Model-based evaluation of sediment control in a drained peatland forest after ditch network maintenance. *Canadian Journal of Forest Research* 48 2: 130–140. DOI: [10.1139/cjfr-2017-0269](https://doi.org/10.1139/cjfr-2017-0269)
- Nieminen M, Piirainen S, Sikström U, Löfgren S, Marttila H, Sarkkola S, Laurén A, Finér L (2018) Ditch

network maintenance in peat-dominated boreal forests: Review and analysis of water quality management options. *Ambio* 47: 535-545. DOI: [10.1007/s13280-018-1047-6](https://doi.org/10.1007/s13280-018-1047-6).

- Nieminen M, Palviainen M, Sarkkola S, Laurén A, Marttila H, Finér L (2018) A synthesis of the impacts of ditch network maintenance on the quantity and quality of runoff from drained boreal peatland forests. *Ambio* 47:523-534. DOI: [10.1007/s13280-017-0966-y](https://doi.org/10.1007/s13280-017-0966-y).
- De Wandeler H, Bruelheide H, Dawud SM, Dănilă G, Domisch T, Finér L, Hermy M, Jaroszewicz B, Joly F-X, Müller S, Ratcliffe S, Raulund-Rasmussen K, Rota E, Van Meerbeek K, Vesterdal L, Muys B (2018) Tree identity rather than tree diversity drives earthworm communities in European forests. *Pedobiologia* 67: 16-25. DOI: [10.1016/j.pedobi.2018.01.003](https://doi.org/10.1016/j.pedobi.2018.01.003).

Other publications (selection):

- Finér L, Čiudienė D, Libietė Z, Lode E, Nieminen M, Pierzgalski E, Ring E, Strand L, Sikström U (2018) WAMBAF – Good Practices for Ditch Network Maintenance to Protect Water Quality in the Baltic Sea Region. *Natural resources and bioeconomy studies* 25/2018. 35 p. <https://jukuri.luke.fi/handle/10024/542099>
- Lazdiņa D, Štāls T, Celma S, Okmanis M, Dūmiņš K, Makovskis K, Neimane S, Jansons J (2018) Eksperimentālais stādījums kūdreņa izcirtumā pēc iepriekš nokaltuša vienvecuma egļu mežu masīva nociršanas. Meža un zemes dziļu resursu izpēte, ilgtspējīga izmantošana – jauni produkti un tehnoloģijas (ResProd). Valsts pētījumu programma, 2014 – 2018, rakstu krājums, lpp. 37-43. Latvijas Valsts koksnes ķīmijas institūts, Rīga. http://kki.lv/doc/projekti/vpp_resprod_rakstu_krajums_2018.pdf
- Leinonen A, Tattari S, Finér L (2018). Mallien käytöstä potkua vesien tilan arviointiin. *Vesitalous* 6/2018. <https://www.vesitalous.fi/>
- Ring E, Andersson E, Armolaitis K, Eklöf K, Finér L, Gil W, Glazko Z, Janek M, Lode E, Libietė Z, Matek S, Piirainen S (2018) Good practices for forest buffers to improve surface water quality in the Baltic Sea region. *Arbetsrapport* 995-2018. 59 p. <https://www.skogforsk.se/contentassets/c091f11901904a7e982b156fc39d2a62/arbetsrapport-995-2018.pdf>

Presentations (selection)

- Clarke N, Environmental sustainability in the circular bioeconomy: the case of forest-based bioenergy in the Nordic countries, 7th European Environmental Evaluators Network Forum, Brussels, 22-23 November 2018.
- Clarke N, Hansen AC, Hegnes AW, Bioenergy risk and risk management in the Nordic countries. Governing sustainability of bioenergy, biomaterial and bioproduct supply chains from forest and agricultural landscapes, Copenhagen, 17-19 April, 2018
- Stupak I, Smith CT, Clarke N, Kline K, Bentsen NS, Dale V, van Dam J, Diaz-Chavez R, Eppler U, Fritsche U, Futter M, Gan J, Hakala K, Horschig T, Junginger M, Larsen S, Lalonde C, Mansoor M, Mai-Moulin TPT, Nair S, Nichiforel L, Palviainen M, Stanturf J, Schaubach K, Tilvikiene V, Titus B, Thrän D, Ukonmaanaho L, Wellisch M, Governing sustainability of biomass producing landscapes and biomass-based supply chains - Key messages from a conference on state of the art and future prospects. EUBCE, Copenhagen, 14-17 May 2018.

Webinars

- Stupak I, Smith CT, Clarke N, Al-Seadi T, Beniušienė L, Bentsen NS, Cheung Q, Dale V, van Dam J, Diaz-Chavez R, Fritsche U, Futter M, Gan J, Hakala K, Horschig T, Junginger M, Kitigawa Y, Kittler B, Kline K, Lalonde C, Larsen S, Lazdiņa D, Mai-Moulin TT, Mansoor M, Mupondwa E, Nair S, Newlands N, Nichiforel L, Palviainen M, Stanturf J, Schaubach K, Sierra JAP, Tilvikiene V, Titus B, Thrän D, Ugarte S, Ukonmaanaho L, Varnagiryte-Kabašinskienė I, Wellisch M, Approaches to creating trust in sustainability of bioenergy through effective governance - Results from collaboration within IEA Bioenergy and other research networks. Webinar, 13 September 2018. <http://cif-ifc.adobeconnect.com/pqj4ewwvskrq/>

6. List other practical outputs during the reporting year (websites, policy recommendations, conferences, scientific meetings, large-scale project applications, research training etc.)

CAR-ES organized or co-organized three scientific meetings in 2018:

- Joint CAR-ES & NB NORD meeting, Skogforsk, Uppsala, 21-22 February, 2018: <https://nordicforestresearch.org/blog/2018/02/28/cooperation-for-sustainable-forestry/>
- International conference: Governing sustainability of bioenergy, biomaterial and bioproduct supply chains from forest and agricultural landscapes, Copenhagen, 17-19 April, 2018; co-organized by CAR-ES, SNS-NKJ network "Effect of bioenergy production from forests and agriculture on ecosystem services in the Nordic and Baltic landscapes", and IEA Bioenergy Task 43 "Biomass feedstocks for bioenergy markets":

<https://ign.ku.dk/bioenergy-conf-2018/>

- SNS-120 final seminar and CAR-ES network meeting, Helsinki, Finland, 31 October - 2 November, 2018

Presentations of the first- and last-mentioned meetings are available at the CAR-ES web site:

<https://nordicforestresearch.org/car-es/events/> (excluding major unpublished data), and those of the bioenergy meeting at the conference web site. Some presentations are also available at the CAR-ES ResearchGate site (see below)

We have web sites at the SNS domain: <http://nordicforestresearch.org/car-es/> and at ResearchGate:

<https://www.researchgate.net/project/Centre-of-Advanced-Research-on-Environmental-Services-from-Nordic-Forest-Ecosystems-CAR-ES-III>, where activities are advertised and other information is spread.

CAR-ES and some of its activities were presented in SNS News and Views 4/2018:

<http://nordicforestresearch.org/car-es/>. Several information briefs were also provided at the SNS web site, e.g.,

- <https://nordicforestresearch.org/blog/2018/02/12/final-meeting-sns-network-organizes-conference-on-sustainability/>
- <https://nordicforestresearch.org/blog/2018/02/28/cooperation-for-sustainable-forestry/>

CAR-ES partners trained a large number of forestry professionals in water protection issues through the EU Interreg project "WAMBAF" (coordinated by Swedish Forest Agency, partners from Finland, Latvia, Lithuania, Poland and Sweden).

CAR-ES partners were involved in the following large-scale project proposals:

- EU Life Climate Change Mitigation application "Life OrgBalt", coordinator Andis Lazdins, Silava, Latvia; partners from Estonia, Finland, Latvia and Lithuania. This application got a high-enough grade to pass, and additional information that the Life Office has required has been submitted in February 2019.
- H2020 ITN/ETN application for a spin-off project from the on-going joint CAR-ES project "ForHot", named "Future Arctic". This application was successful and the project will start on June 1, 2019 and end on May 30, 2023. Leading partners in behalf of CAR-ES are Iceland, Denmark and Estonia.
- Tandem Forest Values application to KSLA on Forestry and water quality in Finland and Sweden – a joint mission to meet future challenges with scientific knowledge (coordinator Leena Finér Luke, Finland and co-coordinator Lars Högbom Skogforsk Sweden) (not funded)

Economic report

7. Received grant from SNS for the reporting year (SEK):

450 000

8. Transfer of SNS funds to project partners

Country	Partner organization	Sum (SEK)
Denmark	University of Copenhagen	60 000
Finland		
Sweden	Skogforsk	60 000
Norway	NIBIO	60 000
Iceland	Agricultural University of Iceland	60 000
Estonia	University of Tartu	22 500
Latvia	Latvian State Forest Research Institute (Silava)	22 500
Lithuania	Institute of Forestry, Lithuanian Research Centre for Agriculture and Forestry	22 500
Total SUM		307 500

9. Costs

	SNS funding	External funds*	Total*
Travel and hotel	181 089	262 858	443 947
Meeting costs	21 854	118 342	140 196
Consumables	6 896	571 557	578 454
Salary	240 593	3 930 327	4 170 919
Communication	5 920	0	5 920
Other costs (specify)	5 625	232 036	237 661
Total SUM (SEK)	461 977	5 115 121	5 577 097

* If possible, provide details otherwise summarize the total sum for external funds and total.

Optional: Comments to the economic overview:

External funds for host organization Luke include direct contribution of 67% of eligible costs, 100% of direct overhead costs ("Other costs" under External funds), as well as a major CAR-ES related project (41007-00006700 Novel land-use...; excluding overheads). External funds for other partners consist of salaries covering CAR-ES related work, as well as major CAR-ES related projects.

I hereby declare that the above statements are true to the best of my knowledge

Main applicant's signature, place and date



(Signature)

Natural Resources Institute Finland (Luke) 5/3/2019

(Institution)

(Day / Month / Year)

Signature of the head of the main applicant's research institution



(Signature)

Natural Resources Institute Finland (Luke) 6/3/2019

(Institution)

(Day / Month / Year)

Eeva-Liisa Ryhänen, Vice President, Natural Resources
(Printed name, function)

Second applicant's signature, place and date

.....
(Signature)

.....
(Institution)

.....
(Day / Month / Year)

Third applicant's signature, place and date

Laus Vestergaard

Dept. of Geosciences and Natural Resource Management

University of Copenhagen

05/06/2019

.....
(Signature)

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(Institution)

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(Day / Month / Year)