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## **Synthesis report of project results for stakeholders and policy makers**

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LIFE+ PROJECT NAME or Acronym  
**SNOWCARBO**

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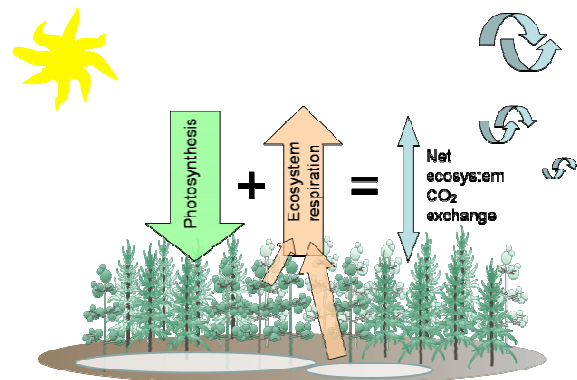


# 1 Introduction

In SnowCarbo project, coordinated by the Finnish Meteorological Institute, **a modeling framework has been set up for climate and land surface to produce spatially more accurate information on the carbon exchange between vegetation, soil and atmosphere.** The modeling is done by implementing REMO climate model and JSBACH modular land surface scheme. In the implementation of the model, mature remote sensing products have been utilized. New land cover data, derived using satellite data, has been taken in to use and physical parameters produced by the model have been compared with same parameters derived from satellite images for model validation.

### REMO-JSBACH Modelling framework describes:

- The uptake of carbon from atmosphere through photosynthesis.
- The release of carbon through respiration in vegetation and soil.
- The transport of carbon dioxide in the atmosphere for estimation of atmospheric CO<sub>2</sub>- concentration.



## 2 Stakeholders and policy makers

In SnowCarbo project, net carbon balance maps were provided for national and international organizations and policy makers responsible for 1) climate change investigations 2) inventory of greenhouse gases and 3) international agreements, their implementation and reporting in Finland. The primary stakeholders of the project in Finland include:

- Ministry of Transport and Communications (governing body of FMI)
  - CO<sub>2</sub> net balance information highly relevant for future traffic regulations
- Ministry of Environment (governing body of SYKE)
  - Project results highly relevant for the implementation of national environmental policy
- Statistics Finland
  - Greenhouse gases (GHG) reporting
- Ministry of Agriculture and Forestry

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- CO<sub>2</sub> net balance of forest holdings highly relevant for the national forestry policy, future regulations, and the development of environmentally sustainable forestry industry.
- Finnish Forest Research Institute (METLA)
  - Methods for calculation of GHG balances of forests
- Agrifood Research Finland (MTT)
  - Methods for calculation of GHG balances of agricultural land

For the European Commission the project results are important concerning Green Paper follow up (adaption policy development) and European Climate Change Programme II (ECCP). The products of SnowCarbo project will also support a number of international environmental monitoring activities, such as Arctic Monitoring and Assessment Programme (AMAP) and Sustained Arctic Observing Networks (SAON) initiative of the Arctic Council, and Global Atmosphere Watch (GAW) programme of the World Meteorological Organization (WMO).

### 3 Benefits and impacts on the results

Climate change indicators are simple ways of presenting difficult information to the public. In order to map the climate change indicators related to boreal ecosystems, we must use modeling tools. The models will enable projections to the future. The magnitude of climate change is dependent on the atmospheric load of the two most important greenhouse gases, carbon dioxide and methane. The terrestrial biosphere plays an important role in the global carbon balance, and boreal forests and peatlands are an important part of the global carbon cycle. Global carbon balance of the terrestrial ecosystems is known in an accuracy of about  $\pm 35\%$  based on atmospheric concentration increase and versatile use of other observational and modeling methods. The uncertainty increases in the regional level, and obtaining accurate figures of country based carbon balances and their future development is a challenge.

To obtain reliable regional carbon balance estimates and accurately predict their future development, spatial coverage of observations should be increased and models calibrated with observations referring to the target region. To interpret and evaluate the results we need knowledge of the regions studied and their specific features. Thus, the contribution of the northern regions to the global carbon balance requires input from researchers who have first-hand knowledge on the climatological conditions and carbon cycling in the boreal zone. In regional modelling it is essential to have up-to-date high-resolution land cover maps and to use vegetation types which correctly correspond to land cover classes. Regional uncoupled models such as developed in SnowCarbo project are important to efficiently develop the processes and scaling approaches. Using regional approach, extreme weather events and their effects and importance on the regional carbon balances can be better quantified.

Main expected longer term benefit from SnowCarbo project is a tool applicable for assessing the impacts of climate change on the land vegetation CO<sub>2</sub> balances for Nordic countries and surroundings. SnowCarbo project provides a tool to assess natural and potential natural CO<sub>2</sub> source and sink strengths. The tool can be also applied in assessing changes of sources and sinks due to land use change or under climate deviating from present.

SnowCarbo project results will make a contribution to GEOSS (The Global Earth Observation System of Systems) and thereby also to (environmental) policies of the European Union. GEOSS



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addresses 9 areas of critical importance to people and society ([www.earthobservations.org/geoss.shtml](http://www.earthobservations.org/geoss.shtml)). Other long-term benefits are

1. Increase of knowledge about carbon balances and their projected changes for boreal areas
2. Benefit to global model-based assessments of the GHG balances especially wetlands (44% of global wetlands occur in Northern latitudes).

The modeling framework, implemented in SnowCarbo- project, can be used to produce information to support national and international climate policy making and monitoring. The central international conventions and programs in European level, which can utilize the results, are:

- **Decision [280/2004/EC](#) of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol.**
  - ▶ UNFCCC (*United Nations Framework Convention on Climate Change*) obligates the members of the convention to compile, update and publish their national greenhouse gas inventories (including carbon dioxide) on regular bases.
- **DG CLIMA - European Climate Change Program (ECCP) – Climate change program of the European Union, concerning all actors in the European Union (public sector, private sector and non governmental organizations)**
  - ▶ The accounting of greenhouse gas emissions in all sectors of society (e.g. forestry and agriculture) and building mechanisms for restricting emissions.
- **DG ENV – (ECCP) Action on Climate Change Post 2012 (Before the establishment of DG CLIMA in 2010) aims at preventing severe effects of climate change by limiting the global warming associated with human activity to under 2°C, when compared to the mean temperature of the pre-industrial era (1850-1899 ).**
  - ▶ Imposing emission limits, regulation of emission trade and monitoring of emissions need comprehensive emission accounting and reporting
- **Other central programs of the European Commission:**
  - DG ENER – Emission trade related to energy production; Research and development aiming at reduction of carbon dioxide emissions
  - DG MOVE – Program for reduction of emissions from land and sea traffic

