



LIFE Project Number

LIFE07 ENV/FIN/000133

Inception Report

Covering the project activities from 01/01/2009 to 30/06/2009

Reporting Date

30/06/2009

LIFE+ PROJECT NAME or Acronym

Monitoring and assessment of carbon balance related phenomena in Finland and northern Eurasia

Data Project

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List of abbreviations

AMSR-E	Advanced Microwave Scanning Radiometer – Earth Observing System
ASCAT	Advanced Scatterometer
ASD	Analytical Spectral Device
AVHRR	Advanced Very High Resolution Radiometer
CEA-LSCE	Commissariat à l'énergie atomique – Laboratoire des Sciences du Climat et de l'Environnement
CO ₂	Carbon dioxide
CORINE	Coordination of information on the environment
EC	European Commission
ECMWF	European Centre for Medium-Range Weather Forecasts
ENVISAT	Environmental Satellite
EO	Earth Observation
ESA	European Space Agency
EU	European Union
FMI	Finnish Meteorological Institute
GAW	Global Atmospheric Watch
GMES	Global Monitoring of Environment and Security
GSE	GMES Services Element
JSBACH	Jena Scheme for Biosphere-Atmosphere Coupling in Hamburg
MERIS	Medium Range Imaging Spectroradiometer (onboard ENVISAT satellite, ESA)
mmu	minimum mapping unit
MODIS	Moderate Resolution Imaging Spectroradiometer (onboard Terra and Aqua Satellites, NASA)
NDVI	Normalized Difference Vegetation Index
QuikSCAT	Quick Scatterometer
SCA	Snow Covered Area
SMR	Scanning Multichannel Microwave Radiometer
SSM/I	Special Sensor Microwave Imager
SWE	Snow Water Equivalent
SYKE	Suomen ympäristökeskus (Finnish Environmental Institute)

1 Executive summary

1.1 General progress

SnowCarbo project was started on the 1st January 2009. The official kick-off meeting of the project was held at FMI (Finnish Meteorological Institute) on 15 January 2009. The project will run for 48 months ending at the end of December 2012.

The general progress in the project has been very good. The partnership agreements have been signed with all the associated beneficiaries in June 2009 (see Sections 2.3 and 5.1 for details). All activities within the Actions have been started on time and the progress is inline with the planned project schedule.

1.2 Assessment as to whether the project objectives and work plan are still viable

The project objectives and the work plan were assessed carefully by the project team during the first weeks of the project. All project objectives were found fully viable. The work plan in the project proposal was also found viable. However, more detailed planning of the activities within the Actions was found necessary. This planning has been carried out by the Action managers and more detailed plans for progress until the next progress report has been outlined in Section 3.3 of this Inception report. All Action teams have also prepared lists of intermediate objectives for the full duration of the project for the use of the Action managers and the project management. The close cooperation of Principal Investigator and the Project Manager at FMI together with the Partner coordinators at SYKE (Finnish Environment Institute) and at CEA-LSCE (Commissariat à l'énergie atomique – Laboratoire des Sciences du Climat et de l'Environnement) ensures that the activities between the project partners are fully coordinated and the collaboration runs seamlessly.

1.3 Problems encountered.

The project team has not identified serious problems impacting the project objectives, work plan or schedule.

A large IT-reform has taken place at SYKE and the processing platform for satellite images (Action 3) has not been put up as quickly as the originally planned. The problem has been solved by using the old existing platform after rearrangements of the storage and computing capacity. Thus, the schedule for performing Action 3 as planned has been recovered.

2 Administrative part

2.1 Description of project management

The project manager has been in close contact with the partner coordinators, representatives of the project stakeholders and project personnel throughout the first 6 months of the project. The first official project meeting, the Kick-off was organised on 15 January 2009. A Management Board meeting was held during the Kick-off as a telephone conference with the CEA-LSCE partner coordinator, Philippe Ciais. An additional Steering Group meeting was organised on the same day to introduce the project and the project team to the representatives of the project stakeholders.

A number of other meetings has been organised after the project kick-off. The most important meetings involving at least the full project team in one of the participating institutes are listed in Table 1. In addition the members of the project team have worked very closely together and have held smaller, informal meetings in FMI or in SYKE to coordinate the project activities.

2.2 Organigramme of the project team and the project management structure

The management and monitoring of the progress in the SnowCarbo project is carried out by management and steering groups, who will meet regularly during the project. The Management Board of the project is formed by

- project Principal Investigator (Prof. Jouni Pulliainen, FMI),
- Project Manager (Mr. Juha-Pekka Luntama, FMI),
- Partner Coordinators (Mr. Olli-Pekka Mattila, SYKE and Dr. Philippe Ciais, CEA-LSCE),
- Project secretaries (Ms. Riikka Aikio, FMI and Ms. Tuija Qvarnberg, SYKE),
- Action Managers.

The project Steering Group includes

- Principal Investigator
- Project Manager, Partner Coordinators
- Institute Evaluators (Prof. Yrjö Viisanen, FMI and Dr. Yrjö Sucksdorff, SYKE)
- the representatives of the stakeholders (Statistics Finland, Ministry of Transport and Communications, Ministry of Environment, Ministry of Agriculture and Forestry).

The project teams within the project partners are lead by the Partner coordinators (except at FMI, where the team is lead by the Principal Investigator). The project teams have assigned Action Managers for each action to lead the daily work.

The Management Board and the Steering Groups will meet twice a year. The Steering Group monitors the project progress based on a Progress Report issued by the Management Board. The feedback and recommendations from the Steering group are provided to the project teams through the Management Board. The action personnel of the project will meet at least quarterly to ensure that all project activities are fully coordinated. Small working meeting relevant to ongoing project activities are organised as necessary.

The organigramme of the SnowCarbo project is presented in Figure 1.

2.3 Partnership agreements status and key content

The partnership agreement with SYKE was signed by FMI on 10 June 2009 and by SYKE on 17 June 2009. The agreement with CEA-LSCE was signed on 15 June 2009 by CEA-LSCE and on 26 June 2009 by FMI. The partnership agreement texts are included in the Annexes 5.1.1 and 5.1.2 of this report. Copies of the signature pages of the agreements are provided in Annex 5.1.3.

The Partnership agreements are based on the LIFE+ 2007 Guidelines to Partnership agreements document provided by the Commission and the Common Provisions for Life+ projects. The key aspects where SnowCarbo Partnership agreements include additional

definitions are civil liability, technical activity reports, confidentiality, payment terms, and the jurisdiction clause.

The complete Partnership Agreements for SnowCarbo are included in Section 5.1.

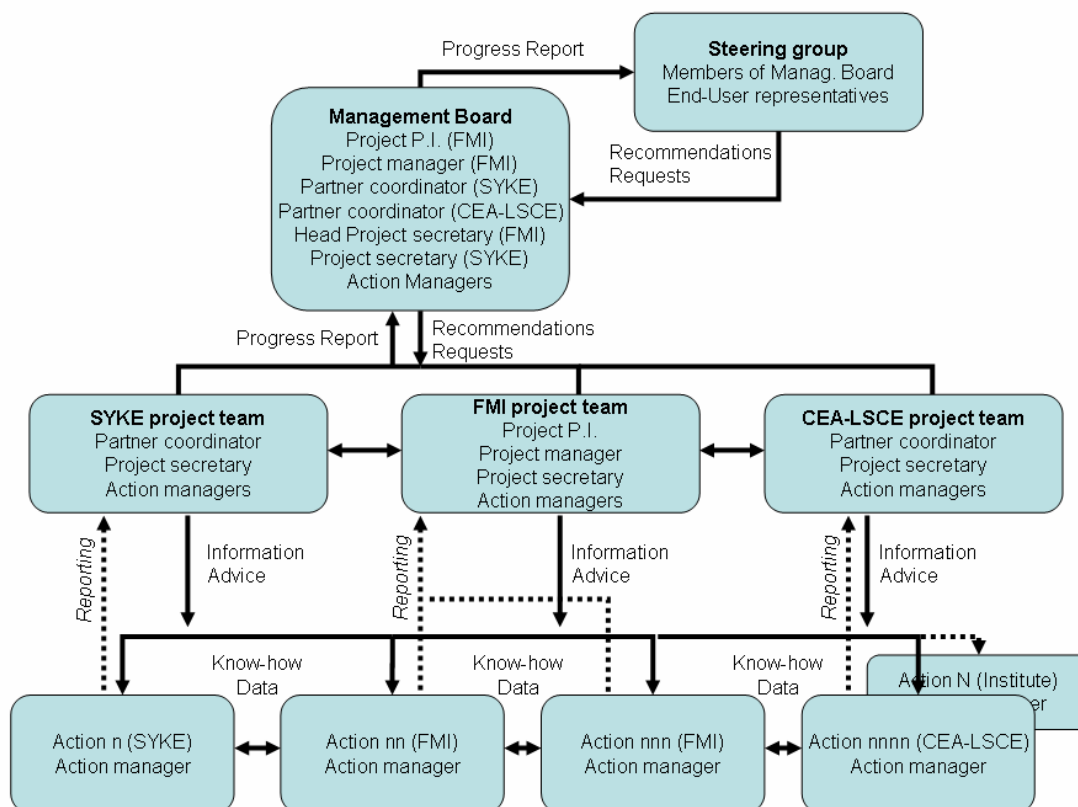


Figure 1. Organigramme of the SnowCarbo project.

3 Technical part

The distribution and magnitudes of carbon sinks and sources of boreal forests are currently poorly known. This handicaps the performance of climate scenarios and the evaluation of anthropogenic influences to climate change. The main objective of the SnowCarbo project is to implement and demonstrate a new innovative approach for the net carbon balance mapping in the northern Eurasian region. This approach is based on a combination of different information sources describing snow evolution, phenology, land cover, CO₂ fluxes and concentrations. The implemented method combines local in situ observations and global Earth observation (satellite) data together with land cover class information in a new way. The annual maps of carbon balance produced by SnowCarbo can be used to aid the definition of the European and national adaptation strategies to climate change impacts and to support the formulation of the environmental legislation and regulations.

3.1 Actions

3.1.1 Action 1: Project management and monitoring

The activities in Action 1 have included arrangements of the official project meetings, coordination and monitoring of the project progress, preparation of the project deliverables according to the project plan, and monitoring of the project expenses.

The main project meetings during the first 6 months of the project are reported in Table 1. The Management Board and the Steering Group meetings have been very successful with good discussions and exchange of opinions between the project managers and the representatives of the stakeholders. Project team meetings and working meetings between project team members have been used to ensure coordination of the project work and clarify any issues related for example to the deliverables between project Actions. At this very early stage of the project, the progress has been measured by discussions between the Principal Investigator, Project Manager, Partner Coordinators and the Action Managers.

The monitoring of the project expenses is based on the financial management systems of the participating institutes (see Section 4.1 for more details).

The only deliverable from Action 1 during the first six months of the project is this Inception report.

Table 1. Main SnowCarbo project meetings during spring 2009.

Meeting	Place	Date	Participants
SnowCarbo Kick-off meeting	FMI	15/01/2009	FMI SYKE Steering group
SnowCarbo 1 st Management Board Meeting	FMI	15/01/2009	FMI SYKE Representatives of the Stakeholders
Planning meeting – EO needs in carbon balance modelling	FMI	06/02/2009	FMI SYKE
Land cover and carbon balance of soil	SYKE	27/02/2009	SYKE 4 project team members Soil carbon exchange expert (Jari Liski)
Management meeting		15/04/2009	FMI: project manager SYKE: coordinator from beneficiary partner
Meeting with the technical advisor appointed by EC	FMI	20/04/2009	FMI: project manager SYKE: coordinator from beneficiary partner Astrale – Life monitoring team
Time-series filtering and	SYKE	25/05/2009	SYKE

interpolation methods			5 project team members
Working meetings			
General meeting within FMI project team	FMI	11/03/2009	FMI
General meeting within SYKE project team	SYKE	27/03/2009 04/04/2009 24/04/2009 08/05/2009 10/06/2009	SYKE

3.1.2 Action 2: Satellite data processing by FMI

The expected outputs of the action contain four distinct satellite data products

- Snow Water Equivalent (SWE) grids
- Snow melt grids (onset of snow melt and snow clearance)
- Soil freezing grids

SWE grids are based on a data assimilation method, incorporating operational synoptic weather station observations and passive microwave satellite data to produce estimates of SWE. The system is used in operational snow services of FMI, providing weekly estimated of SWE for the Eurasian continent. For the purposes of A2, the method will be employed on a historical 30-year time series of satellite (SSM/I, SMMR, AMSR-E) and weather station observations, dating from 1978 to present. The data will be produced in three different grids as indicated in Part B of the Technical applications forms. Each grid pixel will contain the estimated snow water equivalent (in mm).

Preparation for SWE grids product is progressing slightly ahead of the schedule. The necessary satellite data has been acquired and pre-processed. Synoptic weather station data, required as the second assimilation input, has been acquired and pre-processed. Algorithms and software necessary to produce the grids have been developed, based on the FMI operational system. Validation and verification of the software is underway with limited parts of the historical dataset. The full dataset will be produced once the validation and verification process is complete. An example SWE map on January 10 1996 is presented in Figure 2.

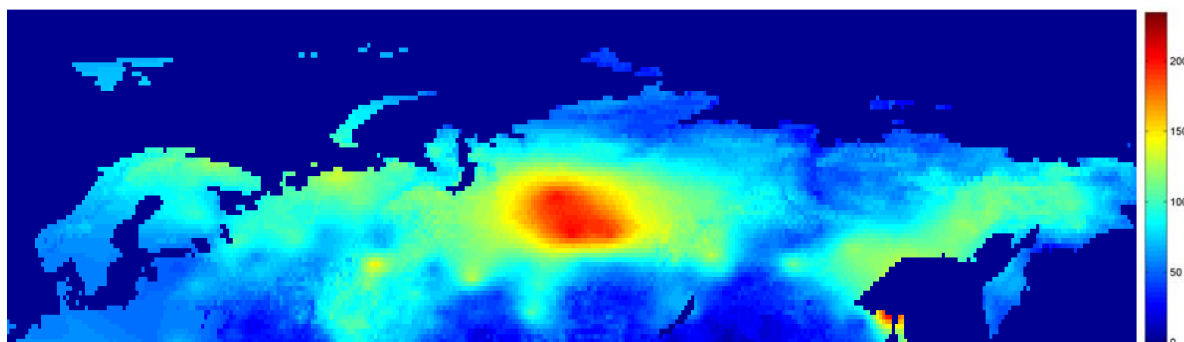


Figure 2. Snow Water Equivalent (mm) map of northern EU states and Eurasia in January 10 1996.

Data used for SWE grids is directly applicable for Snow melt grids. The methodology for this product is based on satellite observations, with validation using synoptic weather station and other ancillary data. Snow melt dates, based on microwave scatterometer observations, are available as an alternative input. These are obtained through Environment Canada (non-funded co-operative partner). The status of the snow melt grids product is comparable to that of the SWE grids explained above. An example of the snow melt maps is presented in Figure 3.

Soil freezing grids product is based on microwave scatterometer observations (ASCAT, QuikSCAT). A dataset spanning 10 years is available. The methodology of producing the soil freezing product has been completed. Data acquisition is underway and partly completed. Validation of the methodology will follow once data acquisition is completed. Production of soil freezing grids product is estimated to be complete according to schedule, barring any major issues observed during the validation process.

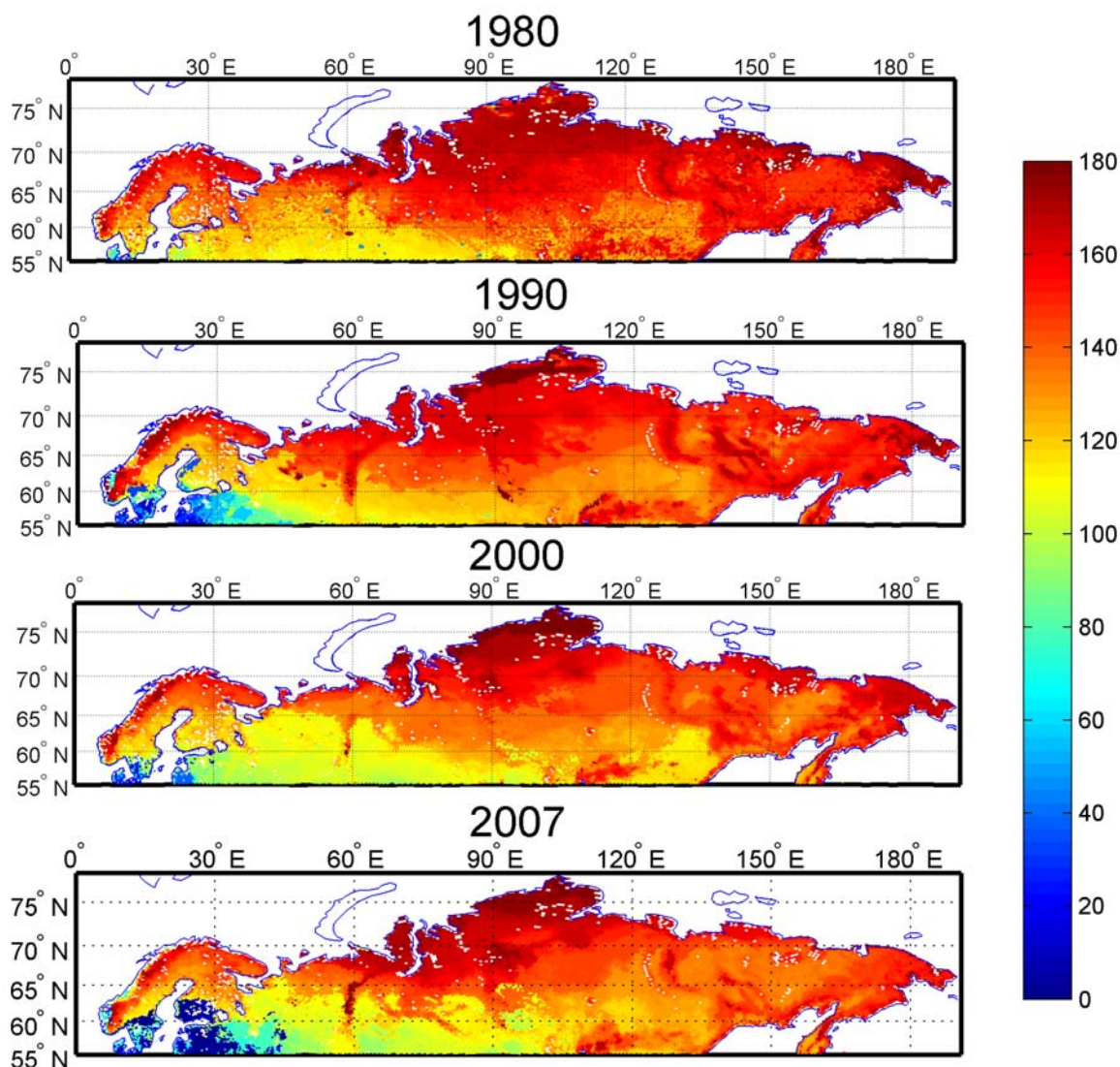


Figure 3. Maps of the on-set of snow melt in northern EU states and Eurasia for years 1980, 1990, 2000 and 2007. The colour corresponds to the day of year.

No significant problems affecting Action 2 completion have been encountered. The estimated completion of the objective is as follows:

- Snow Water Equivalent (SWE) grids– as scheduled (KO+ 24 mo) or earlier

- Snow melt grids – as scheduled (KO+ 24 mo) or earlier
- Soil freezing grids – as scheduled (KO+ 24 mo) or earlier

3.1.3 Action 3: Acquisition and extension of GMES-services GSE Polar View and GSE Land

Environmental parameters based on image data from MODIS Terra (Moderate Resolution Imaging Spectroradiometer) and AVHRR (Advanced Very High Resolution Radiometer) satellites are produced to be used as an input to bio-physical CO₂ models (utilized in Action 6) and for reference data for the final carbon mapping. In Action 3 the satellite images are collected, pre-processed and processed to grids of environmental parameters. In Action 7 this data is used to produce time series of bio-physical parameters used in modelling. The expected output from Action 3 includes:

- Time-series of fractional snow covered area (SCA) grids - A parameter describing the annual and inter-annual evolution of snow cover – years 2001-2008. (Figure 4).
- Time-series of normalized difference vegetation index (NDVI) grids - A parameter describing the annual and inter-annual evolution of vegetation – years 2001-2008. (Figure 4)
- Time-series of night-time surface temperature grids - A parameter describing the temperature conditions for CO₂- exchange – years 2001-2008

Although some of the satellite image data exists in the archives of SYKE, the image datasets are fully retrieved from NASA – data archives. This will ensure homogenous and complete datasets projected to provide more fluent processing. Retrieving of the data will be completed by the end of July.

The pre-processing chain for the images is ready and the processing has started. The algorithms for producing the above environmental variables from the pre-processed satellite data exist, but they will be revised before the production of the final dataset. Intermediate products are archived for possible reprocessing

When the full satellite image datasets from MODIS Terra 2001-2008 are available they are evaluated for the need of complementary data, due to e.g. possible instrument failure, from MODIS Aqua and MERIS- satellites. The lack of visibility due to cloud cover creates gaps in the data, which cannot be compensated with other instruments.

The action is well in schedule and the action plan fully feasible, although the implementation of the intended platform for processing is somewhat delayed due to large IT- reform taking place at the institute. Processing has been started with old platform and processing of the raw gridded dataset is foreseen to be completed in time (see also Section 1.3).

The completed raw-time series are documented in the 1st data document by the end of November. Development of the most suitable atmospheric correction method will be started in the end of year 2009, with expected results in April 2010. The produced satellite image archive is complemented with year 2009 in the beginning of year 2010.

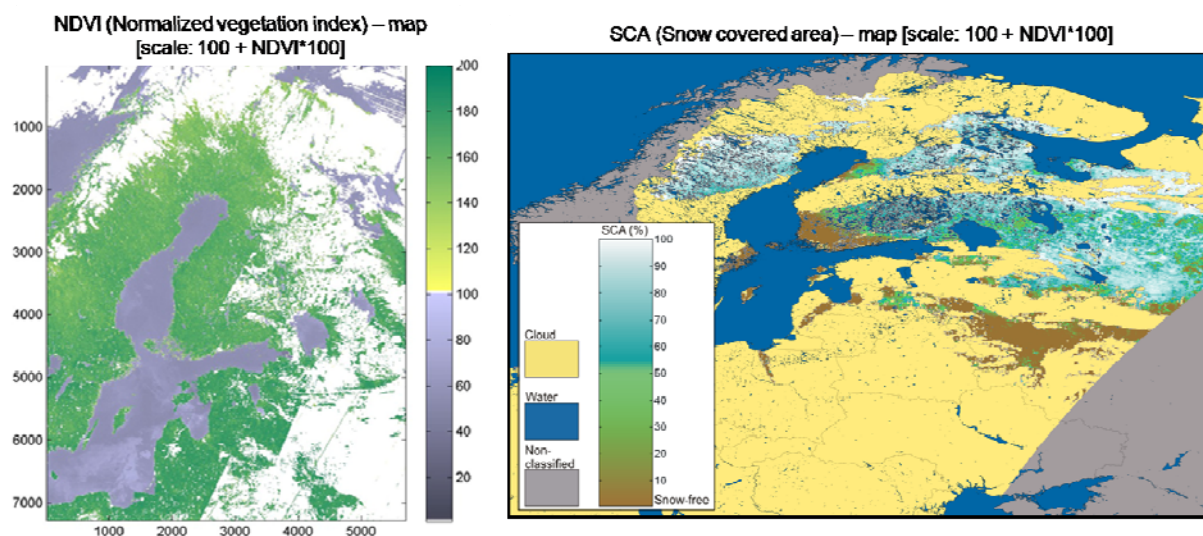


Figure 4. Examples of environmental parameter data grids derived from satellite imagery (MODIS Terra): normalized vegetation index – NDVI (left) and snow covered area – SCA (right).

3.1.4 Action 4: In-situ data collection and processing by FMI

Data coverage and data availability of the GAW site concentration measurements was surveyed together with availability of FMI CO₂ flux data. Quality controlled flux data from certain other Nordic forest sites of CARBOEUROPE network has been received for years 2001 to 2006. These sites are: a 80 years old beech stand in Sorø, Denmark; an average 100 years old mixed site Norunda, Sweden, consisting of Scots pine, Norway spruce and birch; a Scots pine stand in Hyytiälä, Finland planted in 1962. All the data of the CARBOEUROPE sites is available in a database in the above mentioned form in a common dataset and the reference data can be extended for number of sites if the present reference dataset turns out to be too limited as the project progress. Data collection of the in situ data is ongoing up to final target year of this project 2011.

Drawbacks of the available flux and concentration data are in general related to their limited spatial representativeness. Especially the flux data of CARBOEUROPE network is biased towards forest ecosystems while the FMI's own data includes wet land as well as agricultural areas. However this limitation is not crucial as within the target area of the project, land use is typically forest dominated – for instance in Finland the fraction of forest is 87% of total land area. Another drawback concerning last target years of this project might be any delay in processing and storing the in situ data to the data base by the collecting groups.

In general the in situ data collection is started in time and no crucial delays are to be expected in the course of the project.

As the aim of the project is to predict both surface fluxes and atmospheric concentrations of CO₂ with relative high resolution, the model applied in the project need to consider tracer transport as well as surface sources of CO₂ in appropriate time and spatial scales. The regional model REMO (MPI, Hamburg, Germany, see more discussion on the model features in the report on Action 6 where the progress of modelling work is explored) facilitates a rotated spherical coordinate system with the equator located almost in the centre of the computational domain. This results in a nearly quadrangular domain within the target area. The initial data for weather and tracer transport simulations is given in the form of meteorological fields (that is gridded data) and as maps of surface properties. In addition to

standard meteorological fields such as air temperature, liquid water content and 3D velocity fields, the model needs the initial atmospheric concentration fields as well as continuous forcing of those fields from the lateral boundaries. Furthermore the model needs to be provided with the information of fires in the open, anthropogenic sources and sea ecosystem CO₂ balance.

Various possibilities for initial and boundary forcing data fields have been explored during the first months of the project. The candidate data sources are listed in Table 2. Of the listed datasets we initialise the model runs for meteorology with ECMWF reanalysis data. For first simulations with CO₂ sources and boundary fields we utilise the limited TM3 dataset because it is complete, consistent and thoroughly tested.

Table 2. Data source candidates.

Name of the dataset	Source, provider	Included data types	Limitations/ Drawbacks	Spatial resolution	Time resolution	Time coverage
EDGAR4.0	European Commission Joint Research Centre and the Netherlands Environmental Assessment Agency	Surface fluxes due to fires and anthropogenic sources	Limited time coverage, limited time resolution	0.1°	Annual	2001-2005
CarbonTracker	National Oceanic and Atmospheric Administration, US Department of Commerce Global Monitoring Division	3D concentration fields	Coarse resolution for Europe	4°-6°	Three hourly	2001-2007
TM3	TM3 model results from The Atmospheric Tracer Transport Model Intercomparison Project (TransCom)	3D concentration fields with all the relevant surface fluxes and meteorology	Data available for project partners only	1.875°	Six hourly	July 2002
ECHAM5	FMI general circulation model runs with the MPI global model	3D concentration fields and meteorology	Does not represent real years. Does not include either anthropogenic or oceanic sources	approx. 2°	Six hourly	2001-2006
ECMWF Reanalysis data products	European Centre for Medium Range Weather Forecast	Detailed meteorology	No obvious limitations	approx. 1°	Six hourly	2001-present

3.1.5 Action 5: In-situ data collection and processing by SYKE

Archived in-situ data from SYKE and data from dedicated field campaigns are used to validate and calibrate the satellite data products. In Action 5 the dataset is pre-processed and documented to be available for later stages of the project. Data included in the in-situ data in Action 5:

- Snow course data, describing the annual and inter-annual evolution of the snow cover
- Weather station data, including e-code (see below) for describing annual and inter-annual snow cover evolution and climate conditions
- Spectral measurements for describing the optical response of snow seen in the satellite images
- Phenological dataset for describing the annual and inter-annual evolution of vegetation

SYKE data archives include observations and monthly measurements from approximately 120 snow courses in Finland. The data from 2-4 km long courses include a number of snow parameters (i.e. snow depth, snow water equivalent and visual interpretation of the fraction of

snow covered are). The dataset is gathered operationally in SYKE and is therefore complemented during the project to finally cover the period of interest 2001-2011.

Additionally to the SYKE snow courses important snow cover observations are made at the FMI weather station sites. Additionally to the regular weather observations, the snow cover is monitored with e-code, describing the areal coverage and melting status of snow cover (World Meteorological Organization (WMO) standard). This dataset is also complemented during the project by FMI.

The existing procedures and processes for validation of satellite derived SCA data using the in-situ observations presented above will be reviewed and refined to support the current project more effectively.

In-situ data archive of spectral measurements from snow cover was complemented in collaboration with FMI at Sodankylä observatory during spring 2009. Spectral measurements were conducted with ASD (Analytical Spectral Devices Ltd.) Field Spec Pro Jr. to gather information about the spectral response of melting and thinning snow cover. A campaign under SNOWCARBO- project was executed between 27. - 29.4.2009 with measurements from freshly fallen snow under intensive melting. There is still a need for the 2010 measurement campaign for supplement data on spectral response from snow.

A set of phenology observations from the Finnish Forest Research Institute has been purchased. The dataset consists of observations of the growth status of three species of boreal vegetation from years 2001-2008, namely the Downy birch (*Betula pubescens*), the Scots pine (*Pinus sylvestris*) and Bilberry (*Vaccinium myrtillus*). The observation network consists of 23 stations. The dataset holds dates for particular stages of growth of the observed species. Some gaps exist in the dataset and in some cases observations have been stopped in some of the stations, but interpolation and extrapolation methods are examined to patch these insufficiencies. This data will be used to validate the dates extracted from the time-series produced in Action 3 and Action 7. The network of in-situ observations (snow courses, weather stations, phenology observation sites and carbon flux measurement stations) in Finland are displayed in Figure 5.

The in-situ data is largely based on existing datasets and operational services, therefore no significant problems are seen in the execution of the Action 5. Yet, the dataset displays gaps that need to be filled with dedicated field campaigns.

A field campaign in the autumn 2009 is to focus on the phenological status of boreal vegetation. 1st document on In-situ data is produced, due to end of November 2009. The document describes the previously available data, the activities during 2009 and deficiencies in the dataset and plans for 2010. The spring 2010 campaign is to focus on late stages of melting snow cover, when the snow cover is thin and thoroughly wetted and on snow shaded by tree trunks.

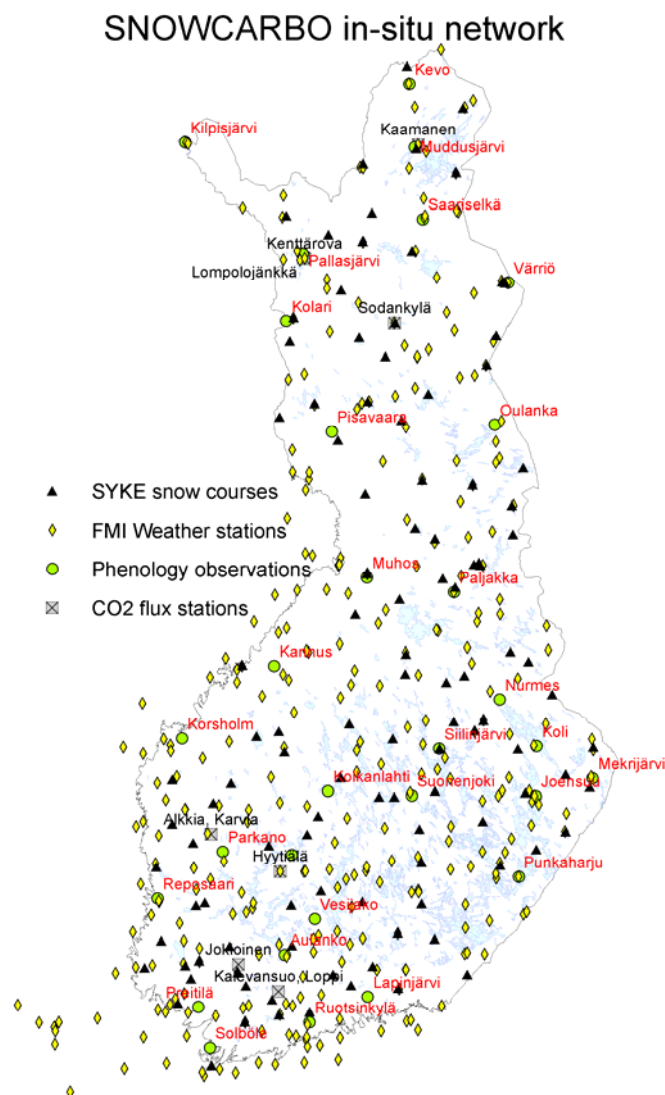


Figure 5. SNOWCARBO – project has available a dense network of in-situ observations from SYKE snow courses, FMI weather stations, METLA (Forest Research Institute) phenological stations and FLUXNET (Global carbon flux measurement network) CO2 stations.

3.1.6 Action 6: Methodology development and implementation by FMI

The atmospheric general circulation model ECHAM5 of the COSMOS model family is operated in FMI. This model includes a modular land surface scheme for the ecosystem-vegetation interactions and is further developed both in MPI, Hamburg and in FMI for more detailed description ecosystem functioning such as soil processes. Especially relevant for SnowCarbo project, is the work on implementing a new approach to predict soil carbon dynamics that is conducted in FMI. Related to the ongoing work FMI possesses two global data sets with a resolution of approximately 2 degrees. One data set has been calculated with the original soil algorithm and the other one with the new soil process implementation Yasso07-model. As boreal ecosystems form the core of Yasso07 soil parameterizations it is specifically suitable for Scandinavia and Siberia. Time resolution of the complete model data set, including atmospheric CO2 concentration and CO2 flux compartments as well as extension of

snow cover, is one month and the simulations cover years from 2001 to 2006 of the years of interest of SnowCarbo. As this data is global it includes the whole area of interest of SnowCarbo and it will be used as reference for more local simulations. The principle of a land ecosystem CO₂ balance modelling is presented in Figure 6.

The drawback of the global model simulations is that they do lack the anthropogenic and oceanic CO₂ sources. Thus the model predictions represent the contribution of land ecosystems to the atmospheric CO₂ balance only. Furthermore, the climate is not forced towards actual weather conditions but is only driven by sea surface temperatures. Consequently the modelled weather conditions do not match with the real weather even at a yearly timescale and thus have to be considered as representative of the climate. This is a drawback concerning this project as the intention is to estimate the CO₂ balance of the specific years. Thus, for one thing, the existing global model data is not considered as boundary data for the regional climate model and for another it is no good for direct areal comparison of surface variables such as snow cover. However, the global data serves as reference for typical range of CO₂ concentration and fluxes as the same soil-vegetation scheme JSBACH that is operated fully coupled in the global model framework will be used in the regional modelling.

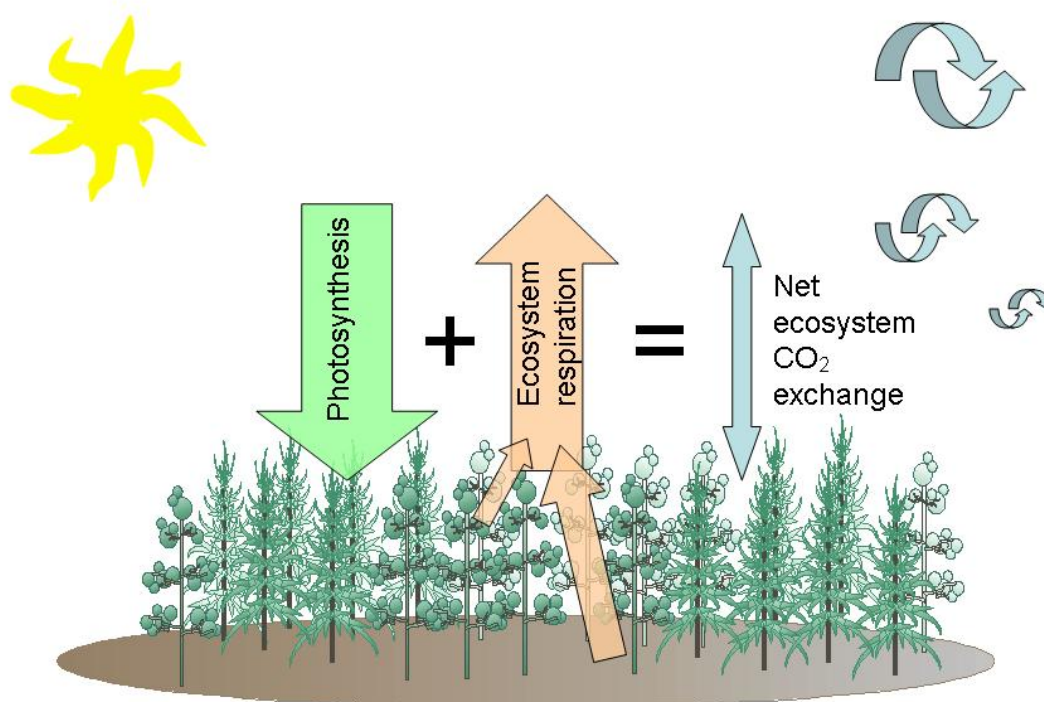


Figure 6. Land ecosystem CO₂ balance is modelled by combining ecosystem processes to their climatic drivers and transport processes in the atmosphere.

For actual aim of determining a detailed map of carbon balance the regional model REMO2008 of MPI Hamburg, Germany will be used. The REMO2008 is able to predict a climate in horizontal resolutions down to 5 km. However, typical resolutions used in former applications have varied between 10 to 55 kilometres. As REMO2008 is based on the DWD operational weather forecast model, it has been evaluated for its predictability of the synoptic

scale meteorological phenomena in several studies. In this work we evaluate the modelled meteorological variables against data from the reference flux sites and specifically from the Pallas GAW site for predictions of CO₂ concentrations.

An up to date model version has been acquired from MPI that will be run for final production runs of this project. However, this model is not fully applicable for this project purposes in its present state as it is missing a crucial part of tracer transport that is needed to distribute the CO₂ from its sources throughout the atmosphere. The REMO2008 model release with tracer transport is expected in the near future.

Selection of first target domain was restricted by several matters. First of all, high topographical gradients should be avoided in the domain border zone to avoid any disturbances in the momentum balance predicted by the model. Secondly, the Pallas GAW station in the North-Western Finnish Lapland is supposed to be the core target area of the project. Thus, to avoid any disturbances due to Scandinavian mountain range whose roots reach the Pallas field area, the Scandinavia as whole was included in the model domain. Consequently the model computational domain includes Finland, Sweden, Norway and Denmark as whole as well as the Baltic countries: Estonia, Latvia and Lithuania; together with areas from most Northern Germany and Western parts of Russia. This is adequate for this project as the Northern Europe as whole is one of the target areas of the project. However, this large a domain cannot be processed with such a high resolution of 10 km as we first wanted to but we need to reduce the resolution to 50 km. The drawback because of reduced resolution is due to computational restrictions and may improve already during the project.

Even though meteorology is thoroughly described in REMO its surface scheme is rather restricted accounting for mainly the components important for surface energy balance whereas a description of CO₂ balance is missing from the basic model framework. Nevertheless, for the present project land vegetation – atmosphere – carbon exchange is crucial. Thus the land surface scheme JSBACH (Jena Scheme for Biosphere-Atmosphere Coupling in Hamburg, MPIs of Jena and Hamburg, Germany) used in ECHAM5 model of COSMOS family will be loosely coupled with REMO. This loose coupling will necessitate running REMO twice for each time-step, first to predict the climate for consequent JSBACH prediction of CO₂ ecosystem sources and secondly to spread the CO₂ into atmosphere.

Land use data both in REMO and in JSBACH is based on USGS EROS Data Center Internal Reports which have been provided by U.S. Geological Survey (1997; 2001).

Usually the computation domain specific land use maps have been created in Hamburg separately for each application but for this project the procedure needs to be developed to facilitate the EO data provided by Actions 2, 4 and 9.

JSBACH functioning have to be reduced to a limited domain instead of the global domain it is working now. Besides the efforts made in FMI in the framework of the present project, in MPI Hamburg there is a PHD student working on the task from June 2009 on.

As JSBACH as well as REMO predict their own development of surface properties such as snow cover and soil moisture, this may induce some inconsistency and the degree of coupling have to be considered and tested thoroughly before starting the project production runs.

By the next project report (First-year report) REMO model taking into account the tracer transport, will be running reliably on at least one of the computational facilities available for FMI personnel. In the case the tracer transport is not implemented in REMO2008 by then, we start first runs with REMO5.0_tracer. First trials on REMO JSBACH coupling will be taken as soon as JSBACH with homogenized land use schemes between both. We are aiming at using the actual land cover data of the first project target years from Action 7. However, in the

case of any complications in the processing of the actual data into a form suitable for the production runs, we can use old land use data of U.S. Geological Survey. For first test runs a limited set of the TM3 model data of the TransCom project will be used for initial and boundary conditions of meteorological and concentration fields (see report on Action 4). By the first-year report the initial and boundary data field sources will be selected.

3.1.7 Action 7: Methodology development and implementation by SYKE

In Action 7 time-series are produced from environmental parameters describing the status of snow cover and vegetations, both of which are important components in the processes of carbon exchange between atmosphere and soil and vegetation. The time-series can be used to extract features indicating important changes in the carbon exchange and to use as reference for the inter- and intra-annual carbon cycles.

Action 7 is largely dependent on the progress in Action 3. The algorithms for retrieval of snow and vegetation related products have been re-examined and refined for producing the raw time series. Additionally the processing sequence for extracting time series for a given location is currently developed and constructed.

The raw time-series are defected by gaps introduced mainly due to cloud conditions, prohibiting the utilization of satellite imaging in optical range. The raw time-series are also impeded by random noise. These defects will be negotiated using filtering and interpolation techniques for time-series.

A literature review is currently conducted in order to develop the most suitable time-series filtering, interpolation and feature extraction techniques. First methods are also currently tested to give a first impression on the data. The action is well in schedule and will get more active during 2010 once the entire raw dataset will be complete.

3.1.8 Action 8: Demonstration and validation by FMI

Activities will be started in 2010.

3.1.9 Action 9: Demonstration and validation of EO services

At first phase the relevant documentation is shared via the project website (<http://snowcarbo.fmi.fi>). Due to the preliminary nature of the raw data developed in Action 3 during year 2009 and due to the proximity of FMI and SYKE, the pres-processed satellite image data from Action 3 is delivered using external hard drives if the need for the raw data arises, although this is not foreseen.

As defined in the project plan, the full activity in Action 9 will start in 2010, once the datasets from the other actions are more complete.

3.1.10 Action 10: Generation of carbon assessment end-products

Activities will be started in 2012.

3.1.11 Action 11: Evaluation of required Northern-Eurasian land cover information

Carbon exchange is largely influenced by the land cover and land use. In Action 11 the requirements of the CO₂ models for land cover data are reviewed and the applicability of national, European and Global land cover datasets are investigated. Based on the background

work required datasets are produced to be used in the modelling of the carbon balance and furthermore the production of carbon balance maps. The expected outcome of the Action is:

- Dedicated land cover datasets for feeding the modelling of terrestrial carbon exchange

The existing national CORINE (Coordination of information on the environment) land cover datasets for years 2000 and 2006 and related land cover change (between 2000 and 2006) data are the main source of information for analysis in Finland. The national dataset consists of 44 classes of land cover and land use (e.g. urban areas, forests, agricultural areas etc. and 3 levels of sub-classes). Less detailed (spatially and in classification) European CORINE dataset is utilized for other parts of Europe. The land cover data to be used for analysis in Northern-Eurasia will be selected with during an evaluation process of available existing datasets. The national CORINE and the selected global land cover datasets will be used to produce statistics of environmental parameters of the soil type, vegetation and their characteristics etc. to be used as an input for the carbon balance models. The national and European CORINE datasets are illustrated in Figure 7.

During 2009 the focus of action 11 is in the evaluation process of land cover data needs of carbon balance models. There has been active discussion with the CO₂ modelling team on the requirements of the models for land cover information. Additionally a meeting was held within SYKE, including an expert on soil carbon exchange from SYKE. Evaluation of CO₂ modelling for land cover data needs has not been extensively done before and a scientific paper is foreseen on the subject. An analysis on the discrepancies between national and European CORINE Land cover datasets, known to be well validated, which are primarily used as information source for models covering EU Member States in Northern- Europe, and Globcover 2000 has been started. Derivation of Land cover variables essential in vegetation and snow cover monitoring has been stated.

The assessment report on data needs in carbon cycle modelling is under compilation and is to be finished by the end of August. By the end of the year the focus shifts from data needs to evaluation of applicability of the existing datasets. The action plan is well in schedule fully feasible.

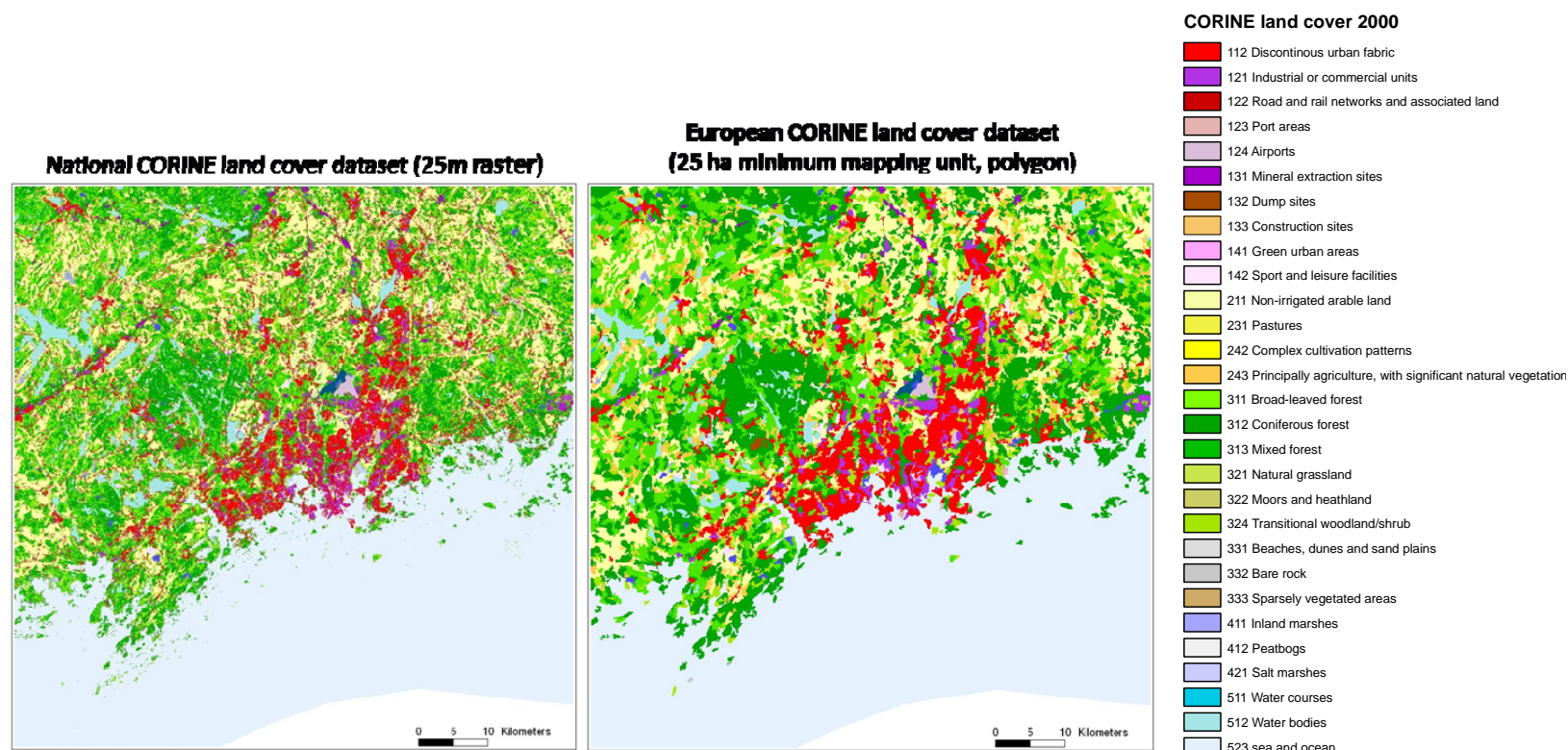


Figure 7. The Finnish national CORINE land cover dataset (left) is a 25m raster product that brings out more detail in land cover and land use compared to the European CORINE (right), where the smallest mapping units are 25 ha. The classification shown here is the third level division, generally used in the European CORINE (with five main classes 100, 200, 300 ... and sub classes down to 3rd level). The National dataset includes also a 4th level, with special attention to forests and peat lands.

3.1.12 Action 12: Dissemination

Dissemination in the framework of SnowCarbo primarily means the distribution of the end products from Action 10. This will start during the last year of the project in 2012.

During the first six months of the project, two deliverables have been specified in the Project Plan:

1. Project website (snowcarbo.fmi.fi). This was established by the start of the project on January 1, 2009. The website contains information about the SnowCarbo project background and objectives to the public. The website also includes two password protected sides. One password is for the members of the project team for project internal deliverables like meeting notes, software items, data, and draft documents. The other password protected side is for deliverables for the project stakeholders. The project website is continuously under development. A bigger update of the website is planned in August 2009 to enhance the layout including a window highlighting the latest events and achievements in the SnowCarbo project.
2. 1st Project brochure. The project brochure was prepared to promote the SnowCarbo project and to provide information about the project to the public in a nice, concise form. The project brochure is available as an online version (lower picture resolution ensuring quick page download) and as a downloadable high resolution version. A number of high quality brochures (200) have also been printed for distribution in relevant meeting, seminars and conferences.

As specified in the project plan, the other dissemination items from the project include:

- the carbon balance atlas,
- the synthesis report on project results,
- distribution of EO and GIS data between project partners,
- publication of the project results to partners, stakeholders, and the public.

Dissemination of the other items listed above is not feasible at this phase of the project as there are only some very preliminary results available. However, the dissemination of all available project information between the project partners has been carried out in the meetings as described in Section 2.1. The project background, objectives and activities have been presented to the stakeholders in the first Steering Group meeting on 15 January 2009.

The dissemination plan for the second half of 2009 is provided in Section 3.3. All project deliverables and their due dates are provided in Table 3 in Section 3.3.2.

3.1.13 Action 13: Auditing

This action is only performed at the end of the project.

3.1.14 Action 14: Project advisory co-operation

The project advisory team has assisted in all teleconferences and communicated with the coordinator as to the set of deliverables and their deadlines for Action 14. Internal meetings at the LSCE have been held to discuss the future work plan of the Climate Scientist

3.1.15 Action 15: After Life+ Communication plan

The detailed plan for communications and actions after the end of the Life+ project will be made during the last project year in 2012.

3.2 Availability of appropriate licences and authorisations

All necessary software licences and authorisations to use observation data and models are available for the project team.

3.3 Envisaged progress until next report

This section provides an overview of the SnowCarbo project progress. Section 3.3.1 provides a detailed list of the envisaged tasks and progress before the end of 2009 and the First-year progress report. An overview for the status of all of the project deliverables and milestones is provided in Section 3.3.2.

3.3.1 Envisaged progress for SnowCarbo actions for the second half of 2009

Action 1: Project management and monitoring

- Project management and monitoring activities a part of the normal work,
- Management Board meeting at the end of August 2009,
- Steering group meeting in September 2009,
- 1st Monitoring Report of the Steering Group,
- Project meetings,
- Quarterly meetings,
- First-year progress report by the end of December 2009.

Action 2: Satellite data processing by FMI

- The SWE product (see 5.1.2) will be available for all test sites and covering 30 years,
- The SWE product will be validated (in scientific publication),
- The onset of snow melt and snow clearance product will be available for all test sites covering 30 years,
- The snow melt / clearance product will be validated in scientific publications,
- The soil freezing product will be available for all test sites covering 10 years.

Action 3: Acquisition and extension of GMES-services GSE Polar View and GSE Land

- The dataset for 2001-2008 will be completed and documented in the relevant deliverable,
- 1st document on EO- data will be produced (the document will describe the extent and characteristics of the dataset together with documentation of the gaps in the dataset and intended solutions to possible shortcomings),
- The review of the atmospheric correction method is started.

Action 4: In situ data collection and processing by FMI

- The initial and boundary data field sources will be selected.
- 1st Data document will be completed.

Action 5: In-situ data collection and processing by SYKE

- In-situ dataset is supplemented with a field campaign in autumn,
- 1st document on In-situ data is produced (document describes the previously available data, the activities during 2009 and deficiencies in the dataset and plans for 2010).

Action 6: Methodology development and implementation by FMI

- REMO2008 model taking into account the tracer transport, will be running reliably on at least one of the computational facilities available for FMI personnel.
- First trials on REMO JSBACH coupling will be taken as soon as JSBACH with homogenized land use schemes between both.
- We are aiming at using the actual land cover data of the first project target years from Actions 3 and 5 but in the case of any complications in processing the actual data into form suitable for production runs, we use old land use data of U.S. Geological Survey.
- For first test runs a limited set of the TM3 model data of the TransCom project will be used for initial and boundary conditions of meteorological and concentration fields (see report on Action 4).

Action 7: Methodology development and implementation by SYKE

- The unfiltered time-series, in the gridded form, of snow covered area (SCA) and normalized difference vegetation index (NDVI) will be completed by the end of November 2009.

Action 9: Demonstration and validation of EO services

- Implementation of the data exchange method completed.
- Documentation of the data exchange method produced.

Action 11: Evaluation of required Northern-Eurasian land cover information

- The data needs of the modelling team are further elaborated and the appropriate deliverable is produced (Report on land cover data needs for carbon balance mapping) by the end of August 2009.
- The evaluation of available land cover datasets is started after the data needs have been clarified (the evaluation is projected to be completed in the last quarter of 2010).

Action 12: Dissemination

- Presentations in the Management Board and Steering Group meetings.
- Presentations in relevant scientific conferences and seminars.
- Preparation of an online newsletter presenting first project results.
- Layman's article in Finnish in Helsingin Sanomat (one of the main Finnish newspapers with a weekly Science section).
- Project poster describing SnowCarbo project, background and objectives.

Action 14: Project advisory co-operation

- Climate Scientist will be hired by December 2009. The aim of this work is to evaluate potential impacts of this pollution on the energy balance of the seasonal snow cover in near-coastal regions of Northern Eurasia and America, and their impact on snow-cover duration. As snow cover significantly impacts the thermal regime of the underlying soil, and the thermal regime of the soil determines the fate of the large carbon stocks in the soils of the northern high latitudes, we will also investigate the impact of this local forcing on the fate of these carbon reservoirs.
- For this work we will use the Orchidee land surface model, including a formulation of the impact of dust particles of the snow albedo and a representation of the soil carbon balance and internal feedbacks affecting soil carbon fluxes. The model will be adapted to represent the effect of soot particles in the snow. We will then force the model with climate model outputs from recent coupled model simulations and reasonable scenarios of local-scale soot emissions from naval traffic along the future open Northwest and Northeast Passages. The expected outcome of this modelling work is an assessment of the potential local- and global-scale effects, and associated uncertainties, of this local additional climate forcing. This work will be accomplishable in about 18 months.

3.3.2 SnowCarbo deliverable and milestone status

All project deliverable products with the planned and actual delivery dates are presented in Table 3. The achieved and projected milestones for the SnowCarbo project are provided in Table 4.

Table 3. SnowCarbo project deliverables and delivery dates.

		Delivery date	
Deliverable name	Action	Planned	Actual
Inception report	1	30/06/2009	30/06/2009
First-year progress report	1	31/12/2009	
18 month progress report	1	30/06/2010	
Second year progress report	1	31/12/2010	
Report on end-user/stakeholder consultation workshop	1	31/01/2011	
36 month progress report	1	30/06/2011	
Third year progress report	1	31/12/2011	
48 month progress report	1	30/06/2012	
Fourth year progress report	1	31/12/2012	
Final report	1	31/01/2013	
Carbon footprint report (first contributions)	1	31/12/2010	
Carbon footprint report	1	31/12/2012	
1 st Monitoring Report of Steering	1	15/08/2009	

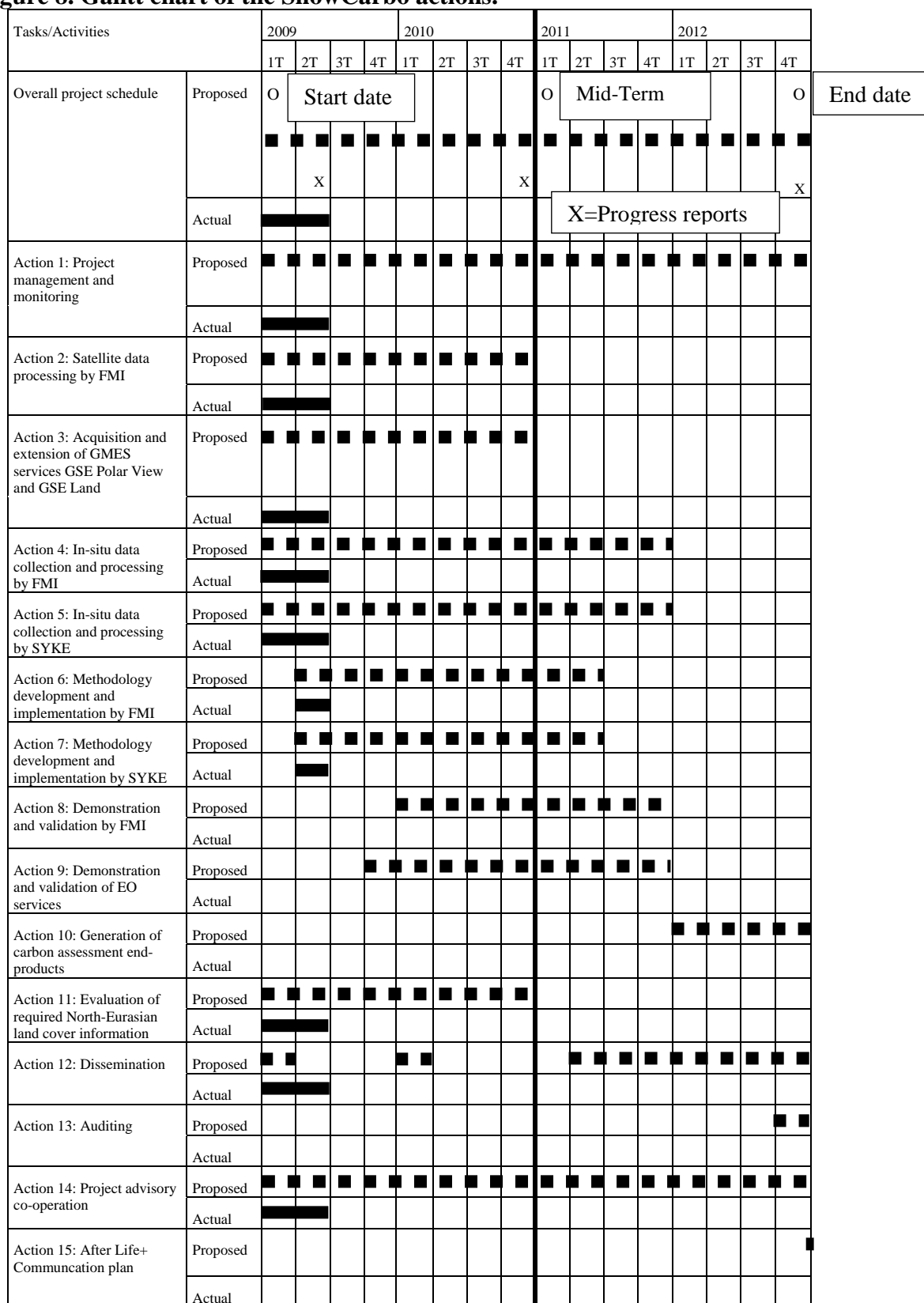
group			
2 nd Monitoring Report of Steering group	1	15/02/2010	
3 rd Monitoring Report of Steering group	1	15/08/2010	
4 th Monitoring Report of Steering group	1	15/02/2011	
5 th Monitoring Report of Steering group	1	15/08/2011	
6 th Monitoring Report of Steering group	1	15/02/2012	
7 th Monitoring Report of Steering group	1	15/08/2012	
8 th Monitoring Report of Steering group	1	15/02/2013	
Website of project	12	01/01/2009	01/01/2009
Project brochures (1 st , updated, final)	12	30/03/2009 30/06/2011 31/12/2012	30/03/2009
Carbon balance atlas for Finland and Baltic EU countries	12	31/12/2012	
Layman's report	12	31/12/2012	
Synthesis report of project results for stakeholders and policy makers (in Finnish and English)	12	31/12/2012	
National stakeholder seminar for presentation of overall project results and synthesis	12	IV/2012	
1 st Document on existing datasets	2,3	30/11/2009	
2 nd Document on existing datasets	2,3	30/11/2010	
Contribution to the Final Report	3,4	30/11/2012	
1 st Data document (years 1980-2009)	4,5	30/11/2009	
2 nd Data document (year 2010)	4,5	30/11/2010	
3 rd Data document (years 2011)	4,5	30/11/2011	
1 st Progress report on methodology	6	31/05/2010	
2 nd Progress report on methodology	6	31/08/2011	
Time series of years 2001-2008	7	30/11/2009	
Time series of years 2009-2010	7	31/03/2011	

Progress report with filtered time series with preliminary filtering techniques (years 2001-2008)	7	31/05/2010	
Progress report with filtered time series with preliminary filtering techniques (years 2001-2010)	7	30/11/2010	
Features extracted (years 2001-2008), preliminary phase progress report	7	31/08/2010	
Features extracted (years 2001-2010), final phase progress report	7	31/09/2011	
Preliminary demonstration report by FMI	8	31/12/2010	
Demonstration report by FMI	8	31/12/2011	
Implemented method with documentation for exchanging the data	9	31/12/2009	
Preliminary demonstration report (SYKE)	9	31/12/2010	
Demonstration report (SYKE)	9	31/12/2011	
Report on carbon balance mappings (FMI)	10	31/08/2012	
Report on land cover data needs for carbon balance mapping (SYKE)	11	31/08/2012	
Report on suitability of global land cover classifications for carbon balance mapping (SYKE, FMI)	11	31/08/2012	
Produced land cover datasets and estimated geophysical parameters (SYKE)	11	01/04/2012	
Report on data production and accuracy assessment (SYKE)	11	01/04/2012	

Table 4. SnowCarbo milestones

Milestone	Action	Date	
		Deadline	Achieved
Inception report	1	30/06/2009	30/06/2009
First-year progress report	1	31/12/2009	
Implemented method with documentation for exchanging the data	9	30/12/2009	

18 month progress report	1	30/06/2010	
Carbon balance mapping demonstration	8	15/11/2010	
Second year progress report (Midterm Report)	1	31/12/2010	
Midterm end-user/stakeholder consultation workshop	1	15/01/2011	
36 month progress report	1	30/06/2011	
Evaluation of continental and regional land cover data completed	11	30/06/2011	
All (2001-2010) EO data processed, seasonal features extracted and data delivered	2,3,6,7	31/09/2011	
Third year progress report	1	31/12/2011	
48 month progress report	1	30/06/2012	
Evaluation of continental and Finnish carbon balances	10	31/08/2012	
Fourth year progress report	1	31/12/2012	
Dissemination workshop (for stakeholders)	12	30/11/2012	
Final Report	1	31/01/2013	

Figure 8. Gantt chart of the SnowCarbo actions.

4 Financial part

4.1 Putting in place of the accounting system.

The monitoring of the project expenses is based on the financial management systems of the participating institutes. All costs including man hours are labelled with the project number and automatically assigned to the appropriate project. A separate book keeping of the project man hours using the time sheets from the EC Life+ website has been performed in addition to the internal book keeping of the participating institutes. The report on the incurred costs until 31 May 2009 is provided in Section 4.3 of this report.

4.2 Continued availability of co-financing.

All SnowCarbo participants are government institutes that have made a commitment to contribute their financing for the project in the respective Coordinating and Associated Beneficiary Declarations. The remaining co-financing is the contribution of the Commission. No other co-financing is foreseen for the SnowCarbo project.

4.3 Costs incurred (summary by cost category and relevant comments).

The incurred costs during the first five months of the SnowCarbo project are provided in Table 5. All cost items are in line with the budget plan in the project proposal. The rate of the expenditure has been slightly lower than projected in the original plan. However, this is mainly due to the limited manpower used in the project during the first project months. The expenditure rate will increase in the second half of 2009 when the manpower of both CEA-LSCE and SYKE in the SnowCarbo project will be reaching the nominal level.

Table 5. SnowCarbo incurred project costs.

Budget breakdown categories	Total cost in €	Costs incurred from the start date to 31.05.2009 in €	% of total costs
1. Personnel	1 817 616.00 €	104 767.58 €	5.76 %
2. Travel and subsistence	30 000.00 €	1 310.70 €	4.37 %
3. External assistance	30 000.00 €	150.00 €	0.50 %
4. Durable goods			
Infrastructure	0.00 €	0.00 €	0.00 %
Equipment	46 000.00 €	884.51 €	1.92 %
Prototype	0.00 €	0.00 €	0.00 %
5. Land purchase / long-term lease	0.00 €	0.00 €	0.00 %
6. Consumables	0.00 €	0.00 €	0.00 %
7. Other Costs	106 000.00 €	0.00 €	0.00 %
8. Overheads	126 011.00 €	6 394.55 €	5.63 %
TOTAL	2 155 627.00 €	113 507.33 €	5.27 %

As foreseen in the project plan, the main cost item in SnowCarbo project is personnel costs. The level of incurred personnel costs after the first five project months is about 92% of the

total incurred project costs. This is slightly above the 85% level foreseen in the project plan. The main reason for this is that majority of the procurements included into the Equipment and Other Costs items have not incurred yet. The incurred equipment costs include external drives that have been procured by SYKE to store large data amounts (Form F4 b in the project proposal).

The Travel and subsistence costs include project personnel missions to field measurement campaigns in Sodankylä and the travel of the project secretary to the LIFE07 Kick-off meeting in Helsinki on 2 March 2009. The mission costs are in line with the expected travel costs in the project plan (Form F2).

The costs included into the External assistance item include the layout design of the 1st project brochure by an external designer. The project brochures are deliverable items specified in the project plan.

The 30% threshold value of the total costs is expected to be reached during the second half of the year 2010. The exact time when that happens depends on when the procurements included into the Equipment and Other Costs are finalised.

It has been noted by the project that the manpower allocation in the project plan may require minor revisions during the project lifetime. It seems possible that the initial man power estimate for some actions is bigger than required while the manpower allocation for other actions is slightly smaller. These issues will be addressed in more detail during the project progress and appropriate reallocation of the manpower will be applied, if necessary. Any need of reallocation of the manpower will naturally be discussed with the representative of the External Monitoring Team and reported accordingly in the project progress reports. In any case the reallocations of the manpower will be minor and their impact on the personnel costs for the respective actions small.

5 Annexes

5.1 Partnership agreements

The partnership agreements between the coordinating beneficiary (FMI) and the associated beneficiaries (SYKE and CEA-LSCE) are provided in this section. For both agreements the full agreement texts are provided in Sections 5.1.1 and 5.1.2 for SYKE and CEA-LSCE, respectively. Copies of the signature pages of the agreements are provided in Section

5.1.1 Partnership agreement for the Finnish Environment Institute

Partnership agreement
Concerning the LIFE project
Monitoring and assessment of carbon balance related phenomena in Finland and northern Eurasia (LIFE07 ENV/FIN/000133)

1. Identification of the contracting parties

The Coordinating Beneficiary

Finnish Meteorological Institute

Arctic research

Erik Palménin aukio 1, FI-00101 Helsinki, Finland

represented by

Yrjö Viisanen

Director of Research and Development

AND

The Associated Beneficiary

Finnish Environment Institute

Mechelininkatu 34a, 002151 Helsinki, Finland

represented by

Kristiina Soini

Director, Information Technology and management

The Coordinating Beneficiary and the Associated Beneficiary being hereinafter referred to as collectively “Parties” or individually “Party”,

HAVE AGREED

2. Subject

This partnership agreement, hereinafter referred to as “the Agreement”, is concluded in relation to the LIFE project Monitoring and assessment of carbon balance related phenomena in Finland and northern Eurasia (LIFE07 ENV/FIN/000133), hereinafter referred to as “the Project”.

The Project shall run for 48 months from 01/01/2009 to 31/12/2012.

The total cost of the Project is estimated at €2.155.627, as shown in the provisional budget in Annex I of the project grant agreement concluded between the Coordinating Beneficiary and the European Commission. The financial support from the Community is 49,09% of the total eligible cost with maximum of €1.046.759.

The grant agreement (and any amendment to the grant agreement) signed by the Coordinating Beneficiary and the European Commission on 5 November 2008, hereinafter referred to as “the Grant Agreement” or “the GA”, which includes special provisions, the Common Provisions, the full project proposal and the other annexes, forms an integral part of this Agreement.

The provisions of the GA shall take precedence over any other agreement, notably the provisions of the Agreement, between the Coordinating Beneficiary and the Associated Beneficiary which may have an effect on the implementation of the above GA.

3. Duration

This Agreement shall enter into force when the last of the two Parties (Coordinating Beneficiary/ Associated Beneficiary) signs the Agreement. The Agreement shall remain in force until all outstanding issues relating to the Project have been finally settled. The provisions that are of permanent nature, such as confidentiality in Article 20 of the Common Provisions and intellectual property rights, shall remain in force.

4. Role and obligations of the coordinating beneficiary

The role and obligations of the Coordinating Beneficiary are defined in Article 4 of the Common Provisions (October 2007) of the EC Life+ program and in the Coordinating Beneficiary Declaration attached to the GA. The financial and technical obligations of the Coordinating Beneficiary are defined in the GA including its annexes such as financial forms.

5. Role and obligations of the Associated Beneficiary

The role and obligations of the Associated Beneficiary are defined in Article 5 of the Common Provisions (October 2007) of the EC Life+ program and in the Associated Beneficiary Declaration attached to the GA. The financial and technical obligations of the Associated Beneficiary are defined in the GA including its annexes such as financial forms.

6. Common obligations for both the Coordinating Beneficiary and the Associated Beneficiary

The common obligations for both the Parties are defined in Article 6 of the Common Provisions (October 2007) of the EC Life+ program.

The Associated Beneficiary agrees to send copies of supporting (accounting) documentation to the Coordinating Beneficiary within one month upon request.

7. Civil liability

A Party that enters into a subcontract or otherwise involves third parties in the Project remains solely responsible for carrying out its relevant part of the Project and for such third party's compliance with the provisions of this Agreement and the GA. It has to ensure that the involvement of third parties does not affect the rights and obligations of the other Party under this Agreement and the GA.

Each Party shall assume sole liability towards third parties in the case of damage of any kind sustained by it while the project is being carried out.

The Parties have especially noted Article 10 of the Common Provisions.

8. Conflict of interest

The Parties have especially noted Article 11 of the Common Provisions according to which the Parties among other things agree to take appropriate measures to prevent conflict of interest and agree to rectify conflict of interest situations.

9. Technical activity reports

The Associated Beneficiary should provide any relevant information to the Coordinating Beneficiary in due time – at least 2 weeks – before the submission of reports to the Commission and be available with additional information, should the Commission request so.

10. Communication actions, publicity for Community support and audio-visual products

Article 13 of the Common Provisions shall apply to this Agreement. The Coordinating Beneficiary and Associated Beneficiaries shall publicise the Project and its results, always

mentioning the Community support received. Details of this activity shall be given in each activity report.

The Coordinating Beneficiary shall create a project website or use an existing website for the dissemination of Project activities, progress and results. This website shall be online at the latest six months after the start of the Project, shall be regularly updated and shall be kept for at least five years after the end of the Project.

11. Confidentiality

Article 20 of the Common Provisions shall apply to this Agreement. The Commission and the Coordinating Beneficiary/Associated Beneficiary undertake to preserve the confidentiality of any document, information or other material communicated to them in confidence, disclosure of which could harm another party. The Parties shall remain bound by this obligation beyond the closing date of the Project.

The personal data included in the Project may be placed on an electronic management tool, which is made available to the European Commission, to other EU institutions and to an external monitoring team, which are bound by a confidentiality agreement provided that this database is in accordance with all applicable laws and regulations. This management tool is used exclusively to manage LIFE project.

12. Ownership and exploitation of results

Each Party shall remain the owner of the results generated by its own personal.

When results are generated by personal of both Parties, the results shall be the ownership of the Parties in the proportion of their contribution (being intellectual, human, material and financial). In this case, each of the joint owners shall be entitled to use their jointly owned results for commercial purposes or to grant non-exclusive licenses to third parties, without any right to sub-license, subject to the following conditions:

- at least 45 days prior notice must be given to the other joint owner(s); and
- fair and reasonable compensation must be provided to the other joint owner(s).

Licences and user rights to the results owned by a sole Party needed for the performance of the own work of the other Party under the Project shall be granted on a royalty-free basis.

Licences and user rights to the results owned by a Party if needed for the use of the other Party's own results including for third-party research shall be granted on fair and reasonable conditions.

In case this article nr 12 and Grant Agreement or Common Provisions shall be considered contradictory the conditions of Grant Agreement and Common Provisions shall prevail, in that order.

13. Financial reporting

Regarding the final statement of expenditure and income, the Associated Beneficiary shall provide the Coordinating Beneficiary with a dated and signed "participant cost statement summary" one month before the Coordinating Beneficiary's deadline for reporting the

Commission at the latest. The same applies also to the mid-term financial statement if relevant.

The Parties agree on:

- a procedure to collect the data and to channel them through the Coordinating Beneficiary regularly;
- clear deadlines, including for providing additional information requested by the Commission ; and
- agree on regular project management and reporting meetings if necessary.

The Associated Beneficiary is obliged to report costs as specified in the Common Provisions and the GA. In particular, the Associated Beneficiary should comply with Part II "financial provisions" of the Commission Provisions.

14. Estimated eligible costs and Associated Beneficiary's financial contribution to the Project

In accordance with the "declaration of the Associated Beneficiary", the Associated Beneficiary will implement actions with an estimated total cost of €832779.

The Associated Beneficiary will contribute € 433197 to the Project of own financial resources.

On the basis of the above amounts, the Associated Beneficiary will receive from the Coordinating Beneficiary a maximum amount of €399582 as share of the EU contribution.

The estimated total costs incurred by the Associated Beneficiary may be reviewed during the Project. In agreement with the Coordinating Beneficiary (which will take into account the total costs of the Project incurred by all participants), the amounts specified in this Article can be modified, provided that the modifications are in accordance with the GA concerning the project budget;

The final settlement will be based on the Commission's assessment of the final statement of expenditure and income and more precisely on the accepted eligible costs of the Project.

15. Payment terms

The Associated Beneficiary shall send at the end of each Project year an invoice of the work done according to the Project plan during that year. The invoices shall contain at least the following information:

- Account holder
 - Address
 - VAT number
- Bank Name
 - Address
 - SWIFT
 - IBAN
- Reference: SnowCarbo / Luntama
- The time period covered by the invoice

Yrjö Viisanen

Presenting official

Yrjö Sucksdorff,

Manager, Geoinformatics and Land Use Division

Representing official

Kristiina Soini,

Director, Information Technology and management

ANNEXES:

- The grant agreement signed between the European Commission and the coordinating beneficiary;
- The Common Provisions
- The revised project proposal including the changes made on July 17th and August 2008.

5.1.2 Partnership agreement for the Commissariat à l’Energie Atomique

Partnership agreement Concerning the LIFE project Monitoring and assessment of carbon balance related phenomena in Finland and northern Eurasia (LIFE07 ENV/FIN/000133)
--

1. Identification of the contracting parties

The Coordinating Beneficiary

Finnish Meteorological Institute

Arctic research

Erik Palménin aukio 1, FI-00101 Helsinki, Finland

represented by

Yrjö Viisanen

Director of Research and Development

AND

The Associated Beneficiary

The **Commissariat à l’Energie Atomique**, hereinafter referred to as “**CEA**”, a French state-owned research entity with a scientific, technical or industrial activity duly organised under the laws of France and having its registered office located Bâtiment Le Ponant D - 25, rue Leblanc - Paris 15ème (France) - and declared at the Paris Register of Commerce and Trade (“*Registre du Commerce et des Sociétés de Paris*”) under the following registration number : R.C.S. PARIS B 775 685 019,

Acting on behalf of the Laboratoire des Sciences de Climat et l’Environnement, located CEA/Saclay, Gif-sur-Yvette, 91191 cedex, France, a joint research unit of the CEA and the Centre national de la Recherche Scientifique, a French public scientific and technological institution, headquartered at 3, rue Michel Ange, 75794 Paris Cedex 16, France,

represented by

Jean-Paul DURAUD

Directeur des Sciences de la Matière Adjoint

The Coordinating Beneficiary and the Associated Beneficiary being hereinafter referred to as collectively “Parties” or individually “Party”,

HAVE AGREED

2. Subject

This partnership agreement, hereinafter referred to as “the Agreement”, is concluded in relation to the LIFE project Monitoring and assessment of carbon balance related phenomena in Finland and northern Eurasia (LIFE07 ENV/FIN/000133), hereinafter referred to as “the Project”.

The Project shall run for 48 months from 01/01/2009 to 31/12/2012.

The total cost of the Project is estimated at €2.155.627, as shown in the provisional budget in Annex I of the project grant agreement concluded between the Coordinating Beneficiary and the European Commission. The financial support from the Community is 49,09% of the total eligible cost with maximum of €1.046.759.

The grant agreement (and any amendment to the grant agreement) signed by the Coordinating Beneficiary and the European Commission on 5 November 2008, hereinafter referred to as “the Grant Agreement” or “the GA”, which includes special provisions, the Common Provisions, the full project proposal and the other annexes, forms an integral part of this Agreement.

The provisions of the GA shall take precedence over any other agreement, notably the provisions of the Agreement, between the Coordinating Beneficiary and the Associated Beneficiary which may have an effect on the implementation of the above GA.

3. Duration

This Agreement shall enter into force when the last of the two Parties (Coordinating Beneficiary/ Associated Beneficiary) signs the Agreement. The Agreement shall remain in force until all outstanding issues relating to the Project have been finally settled. The provisions that are of permanent nature, such as confidentiality in Article 20 of the Common Provisions and intellectual property rights, shall remain in force.

4. Role and obligations of the coordinating beneficiary

The role and obligations of the Coordinating Beneficiary are defined in Article 4 of the Common Provisions (October 2007) of the EC Life+ program and in the Coordinating Beneficiary Declaration attached to the GA. The financial and technical obligations of the Coordinating Beneficiary are defined in the GA including its annexes such as financial forms.

5. Role and obligations of the Associated Beneficiary

The role and obligations of the Associated Beneficiary are defined in Article 5 of the Common Provisions (October 2007) of the EC Life+ program and in the Associated Beneficiary Declaration attached to the GA. The financial and technical obligations of the Associated Beneficiary are defined in the GA including its annexes such as financial forms.

6. Common obligations for both the Coordinating Beneficiary and the Associated Beneficiary

The common obligations for both the Parties are defined in Article 6 of the Common Provisions (October 2007) of the EC Life+ program.

The Associated Beneficiary agrees to send copies of supporting (accounting) documentation to the Coordinating Beneficiary within one month upon request.

7. Civil liability

A Party that enters into a subcontract or otherwise involves third parties in the Project remains solely responsible for carrying out its relevant part of the Project and for such third party's compliance with the provisions of this Agreement and the GA. It has to ensure that the involvement of third parties does not affect the rights and obligations of the other Party under this Agreement and the GA.

Each Party shall assume sole liability towards third parties in the case of damage of any kind sustained by it while the project is being carried out.

The Parties have especially noted Article 10 of the Common Provisions.

8. Conflict of interest

The Parties have especially noted Article 11 of the Common Provisions according to which the Parties among other things agree to take appropriate measures to prevent conflict of interest and agree to rectify conflict of interest situations.

9. Technical activity reports

The Associated Beneficiary should provide any relevant information to the Coordinating Beneficiary in due time – at least 2 weeks – before the submission of reports to the Commission and be available with additional information, should the Commission request so.

10. Communication actions, publicity for Community support and audio-visual products

Article 13 of the Common Provisions shall apply to this Agreement. The Coordinating Beneficiary and Associated Beneficiaries shall publicise the Project and its results, always

mentioning the Community support received. Details of this activity shall be given in each activity report.

The Coordinating Beneficiary shall create a project website or use an existing website for the dissemination of Project activities, progress and results. This website shall be online at the latest six months after the start of the Project, shall be regularly updated and shall be kept for at least five years after the end of the Project.

11. Confidentiality

Article 20 of the Common Provisions shall apply to this Agreement. The Commission and the Coordinating Beneficiary/Associated Beneficiary undertake to preserve the confidentiality of any document, information or other material communicated to them in confidence, disclosure of which could harm another party. The Parties shall remain bound by this obligation beyond the closing date of the Project.

The personal data included in the Project may be placed on an electronic management tool, which is made available to the European Commission, to other EU institutions and to an external monitoring team, which are bound by a confidentiality agreement provided that this database is in accordance with all applicable laws and regulations. This management tool is used exclusively to manage LIFE project.

12. Ownership and exploitation of results

Each Party shall remain the owner of the results generated by its own personal.

When results are generated by personal of both Parties, the results shall be the ownership of the Parties in the proportion of their contribution (being intellectual, human, material and financial). In this case, each of the joint owners shall be entitled to use their jointly owned results for commercial purposes or to grant non-exclusive licenses to third parties, without any right to sub-license, subject to the following conditions:

- at least 45 days prior notice must be given to the other joint owner(s); and
- fair and reasonable compensation must be provided to the other joint owner(s).

Licences and user rights to the results owned by a sole Party needed for the performance of the own work of the other Party under the Project shall be granted on a royalty-free basis.

Licences and user rights to the results owned by a Party if needed for the use of the other Party's own results including for third-party research shall be granted on fair and reasonable conditions.

In case this article nr 12 and Grant Agreement or Common Provisions shall be considered contradictory the conditions of Grant Agreement and Common Provisions shall prevail, in that order.

13. Financial reporting

Regarding the final statement of expenditure and income, the Associated Beneficiary shall provide the Coordinating Beneficiary with a dated and signed "participant cost statement summary" one month before the Coordinating Beneficiary's deadline for reporting the

Commission at the latest. The same applies also to the mid-term financial statement if relevant.

The Parties agree on:

- a procedure to collect the data and to channel them through the Coordinating Beneficiary regularly;
- clear deadlines, including for providing additional information requested by the Commission ; and
- agree on regular project management and reporting meetings if necessary.

The Associated Beneficiary is obliged to report costs as specified in the Common Provisions and the GA. In particular, the Associated Beneficiary should comply with Part II "financial provisions" of the Commission Provisions.

14. Estimated eligible costs and Associated Beneficiary's financial contribution to the Project

In accordance with the "declaration of the Associated Beneficiary", the Associated Beneficiary will implement actions with an estimated total cost of €197 755.

The Associated Beneficiary will contribute € 100 677 to the Project of own financial resources.

On the basis of the above amounts, the Associated Beneficiary will receive from the Coordinating Beneficiary a maximum amount of €97 078 as share of the EU contribution.

The estimated total costs incurred by the Associated Beneficiary may be reviewed during the Project. In agreement with the Coordinating Beneficiary (which will take into account the total costs of the Project incurred by all participants), the amounts specified in this Article can be modified, provided that the modifications are in accordance with the GA concerning the project budget;

The final settlement will be based on the Commission's assessment of the final statement of expenditure and income and more precisely on the accepted eligible costs of the Project.

15. Payment terms

The Associated Beneficiary shall send at the end of each Project year an invoice of the work done according to the Project plan during that year. The invoices shall contain at least the following information:

- Account holder
 - Address
 - VAT number
- Bank Name
 - Address
 - SWIFT
 - IBAN
- Reference: SnowCarbo / Luntama
- The time period covered by the invoice

- A breakdown of the costs into cost items (salaries, travel, procurements, etc.)

The Parties agree that all payments are considered as pre-financing payments until the Commission has approved the final technical and financial reports and has transferred the final payment to the Coordinating Beneficiary;

The Coordinating Beneficiary transfers the share of the final payment to the Associated Beneficiary after the Commission has made the final payment.

16. Commission financial audit

Article 32 of the Common Provisions shall apply to this Agreement. The Commission has the right to audit the Associated Beneficiary at any time during the Project implementation and up to five years after the final payment of the Community contribution as explained in Article 32 of the Common Provisions.

17. Checks and inspections

Article 33 of the Common provisions shall apply to this Agreement. The Parties undertake to allow Commission staff and persons authorised by the Commission appropriate access to their sites or premises where the Project is being carried out and to all documents relating to the technical and financial management of the operation. Access by persons authorised by the Commission may be subject to confidentiality arrangements to be agreed between the Commission and the Coordinating Beneficiary.

18. Land/rights purchase, land lease

Common Provisions, Article 35 on the Associated Beneficiary's obligation to assign the purchased assets shall apply to this Agreement.

19. Termination of the Agreement

The Coordinating Beneficiary may terminate the Agreement as stated in Article 19.6 of the Common Provisions. The Parties note and agree on the Commission's right to terminate the grant agreement as stated in Article 19 of the Common Provisions.

20. Jurisdiction clause

Failing amicable settlement, any disputes between the Parties in respect of this agreement shall be settled according to Arbitration Rules of Helsinki Commerce Chamber. The arbitration shall take place in Helsinki and the arbitration language shall be English.

The law applicable to this Agreement shall be the law of Belgium excluding its rules on conflict of laws.

Done at Helsinki on _____.____.2009 and at Paris on _____.____.2009, in duplicate in English.

For the coordinating beneficiary

For the associated beneficiary

ANNEXES:

- The grant agreement signed between the European Commission and the coordinating beneficiary;
- The Common Provisions
- The revised project proposal including the changes made on July 17th and August 2008.

5.1.3 Signatures of the Partnership agreements

Article 32 of the Common Provisions shall apply to this Agreement. The Commission has the right to audit the Associated Beneficiary at any time during the Project implementation and up to five years after the final payment of the Community contribution as explained in Article 32 of the Common Provisions.

17. Checks and inspections

Article 33 of the Common provisions shall apply to this Agreement. The Parties undertake to allow Commission staff and persons authorised by the Commission appropriate access to their sites or premises where the Project is being carried out and to all documents relating to the technical and financial management of the operation. Access by persons authorised by the Commission may be subject to confidentiality arrangements to be agreed between the Commission and the Coordinating Beneficiary.

18. Land/rights purchase, land lease

Common Provisions, Article 35 on the Associated Beneficiary's obligation to assign the purchased assets shall apply to this Agreement.

19. Termination of the Agreement

The Coordinating Beneficiary may terminate the Agreement as stated in Article 19.6 of the Common Provisions. The Parties note and agree on the Commission's right to terminate the grant agreement as stated in Article 19 of the Common Provisions.

20. Jurisdiction clause

Failing amicable settlement, the Court of Helsinki shall have sole competence to rule on any dispute between the contracting parties in respect of this agreement.

The law applicable to this agreement shall be the law of Finland, excluding its rules on conflict of laws.

Signed

in Helsinki on 10.6.2009 and in Helsinki on 17.6.2009, in duplicate in English.

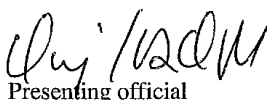


For the coordinating beneficiary

Tuija Pulkkinen on behalf of

Yrjö Viisanen

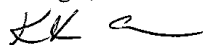
For the associated beneficiary



Presenting official

Yrjö Sucksdorff,

Manager, Geoinformatics and Land Use Division



Representing official

Kristiina Soini,

Director, Information Technology and management

Figure 9. Signature page for the Partnership Agreement between FMI and SYKE.

- IBAN
- Reference: SnowCarbo / Luntama
- The time period covered by the invoice
- A breakdown of the costs into cost items (salaries, travel, procurements, etc.)

The Parties agree that all payments are considered as pre-financing payments until the Commission has approved the final technical and financial reports and has transferred the final payment to the Coordinating Beneficiary;

The Coordinating Beneficiary transfers the share of the final payment to the Associated Beneficiary after the Commission has made the final payment.

16. Commission financial audit

Article 32 of the Common Provisions shall apply to this Agreement. The Commission has the right to audit the Associated Beneficiary at any time during the Project implementation and up to five years after the final payment of the Community contribution as explained in Article 32 of the Common Provisions.

17. Checks and inspections

Article 33 of the Common provisions shall apply to this Agreement. The Parties undertake to allow Commission staff and persons authorised by the Commission appropriate access to their sites or premises where the Project is being carried out and to all documents relating to the technical and financial management of the operation. Access by persons authorised by the Commission may be subject to confidentiality arrangements to be agreed between the Commission and the Coordinating Beneficiary.

18. Land/rights purchase, land lease

Common Provisions, Article 35 on the Associated Beneficiary's obligation to assign the purchased assets shall apply to this Agreement.

19. Termination of the Agreement


The Coordinating Beneficiary may terminate the Agreement as stated in Article 19.6 of the Common Provisions. The Parties note and agree on the Commission's right to terminate the grant agreement as stated in Article 19 of the Common Provisions.

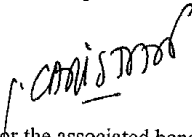
20. Jurisdiction clause

Failing amicable settlement, any disputes between the Parties in respect of this agreement shall be settled according to Arbitration Rules of Helsinki Commerce Chamber. The arbitration shall take place in Helsinki and the arbitration language shall be English.

The law applicable to this Agreement shall be the law of Belgium excluding its rules on conflict of laws.

Done at Helsinki on 26. 6. 2009 and at Paris on 15 JUN 2009, in duplicate in English.


For the coordinating beneficiary


For the associated beneficiary

YRJÖ VIISANEN
RESEARCH DIRECTOR

Yves CARISTAN
Directeur des Sciences de la Matière

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Figure 10. Signature page for the Partnership Agreement between FMI and CEA-LSCE.

5.2 Deliverables

The deliverables for the first six months of the SnowCarbo project are:

- Project website: <http://snowcarbo.fmi.fi>
- 1st project brochure: included in Annex 5.3.1.
- Inception Report: this report

5.3 Maps, drawings, technical designs, technical memos etc. as appropriate.

Two annexes have been included into this section. Annex 5.3.1 shows the 1st Project brochure that is one of the deliverables of Action 12 for 2009. Annex 5.3.2 contains the abstract that has been accepted for a poster presentation in SPIE-ERS 2009 meeting in Berlin.

5.3.1 1st Project brochure

The first project brochure published at the end of March 2009 to provide information about the SnowCarbo project is presented in the figures below. The full size brochure is downloadable from the project website (<http://snowcarbo.fmi.fi>).





5.3.2 SPIE Europe Remote Sensing abstract

This is an abstract that has been submitted by the project team (FMI/SYKE) and accepted for a poster presentation in the SPIE-ERS meeting in Berlin on 31 August - 3 September 2009.

Spatial Data Requirements of Carbon Balance Modelling

Ground based observations of land ecosystem carbon balance are sparsely distributed, therefore modeling tools are needed in order to acquire spatially more detailed view of this important climatic quantity. Currently there are several research groups in Finland doing this kind of modeling work at Finnish Meteorological Institute, University of Helsinki and Finnish Environment Institute. Finnish Environment Institute, Geomatics and Land Use Division provides spatial data for these research groups in co-operation research projects like EU-funded SnowCarbo and national Carb-Bal.

The purpose of this paper is to study the data requirements of different models and how remote sensing based data products can fulfil them. In other words, aim is to

- Present an overview of different models used: why different models are used and what kind of spatial data they require about land cover and phenology
- Study how European CORINE Land Cover classification can be utilized and what kind of information is required in addition to CORINE
- Study the possibilities to use global GlobCover classification as input for models
- Study needs for other data sources, like products of Geoland2-project

Models of Cosmos family, developed by MPI-Hamburg are used to simulate past present and future climates over wide range of spatial resolution at Finnish Meteorological Institute. Their applications include analyzing the climate system and projecting climate change. They require

knowledge about atmosphere, topography, land cover in raster map format, development of vegetation like monthly values concerning fraction or LAI of vegetation and status of land such as albedo, soil moisture and extent of snow cover.

Land cover data available consists of CORINE Land Cover and GlobCover classifications. Finland has national version of CORINE with 25 m pixel size and 44 classes, while the minimum mapping unit of European CORINE is 25 ha. GlobCover covers whole world with 300 m pixel size, but the number of classes is less. GlobCover 2.1 has been compared to Finnish national CORINE and the largest difference seems to be that agricultural areas of CORINE have been classified as sparsely vegetated areas in GlobCover. Comparison to GlobCover 2.2 will be made later.

5.4 Output indicators. Definition.

SnowCarbo project is based the results of many years of scientific research in the participating institutes. As defined in the project plan, the objective of the project is “to develop a system to provide reliable annual maps of carbon balance for northern latitudes”. This development is based on a large number of scientific studies and on the experience of the participating institutes and the researchers.

OUTPUTS

Part 1 - Preparatory actions

Table 6. SnowCarbo preparatory actions.

Types of preparatory actions	No.	Budgeted cost (€)
Feasibility studies		
Legislative reviews		
Cost-benefit studies		
Market analysis		
Permit studies		
Permit applications		
Permits obtained		
Environmental impact assessment studies		
Scientific studies	> 10	
Detailed engineering studies		
Monitoring actions		
Action plans		
Management plans		
Inventories & Studies		
<i>Ex ante</i> environmental monitoring		
<i>Ex post</i> environmental monitoring		
Other (please specify)		
Total budgeted cost (€)		

The scientific background of the SnowCarbo project is reflected in the definition of the Preparatory actions in Table 6. The total number of scientific studies that has lead into the implementation of the SnowCarbo project is significantly over 10. These studies have been

performed within different frameworks (national, bilateral and multilateral projects, ESA studies, etc.) over a long time period. It should also be noted that many of these studies have been conducted by the researchers contributing to SnowCarbo, but before they have been employed by their current institutes. Thus, providing the cost figure for the studies is not feasible.

The main deliverables by the SnowCarbo project are listed in Table 7 below (please note that a full list of deliverables is provided in Table 3 in Section 3.3.2). The main deliverable from the project is the system providing annual maps of carbon balance. This system is represented by the number of the software items Table 7. Although this system naturally contain a large number of individual software components, in the framework of this project it is considered as one system.

SnowCarbo project will produce a large number of reports that do not fit into the guidelines or manuals category that are listed in Table 7. Thus, they have been included under “others”. These reports include:

- Report on end-user/stakeholder consultation workshop
- Final report
- Project brochures (1st, updated, final)
- Carbon balance atlas for Finland and Baltic EU countries
- Layman’s report
- Synthesis report of project results for stakeholders and policy makers (in Finnish and English)
- 2nd Document on existing datasets
- 1st Data document (years 1980-2009)
- 2nd Data document (year 2010)
- 3rd Data document (years 2011)
- 2nd Progress report on methodology
- Demonstration report by FMI
- Demonstration report by SYKE
- Report on carbon balance mappings (FMI)
- Report on land cover data needs for carbon balance mapping (SYKE)
- Report on suitability of global land cover classifications for carbon balance mapping (SYKE, FMI)
- Report on data production and accuracy assessment (SYKE)

The deliverables are produced as part of the normal project work and their costs can not be isolated from the overall project costs. The overall project costs (total and incurred) are reported in Section 4.3.

OUTPUTS**Part 2 - Concrete actions****Table 7. Main project deliverables (project implementation phase)**

Deliverable	No.	Budgeted cost (€)
Prototypes		
Pilot plants		
Techniques/Methodologies developed		
Software	1	
Successful implementation of demonstration actions		
Monitoring techniques developed		
Monitoring performed		
Guidelines		
Manuals		
Others (please specify)	19	
Total budgeted cost (€)		

There are not dedicated training activities in the SnowCarbo project. The end-users and stakeholders of SnowCarbo products will receive information through the two workshops that are organised during the project (midterm and dissemination workshops). These are indicated in Table 8. At the moment it is not possible to estimate the number of participants for these workshops. The venue and organising costs for the seminars are included into the SnowCarbo project proposal financial plan.

Table 8. Training activities

No. of training sessions	Total no.of persons trained	Budgeted cost (€)
2		10 000