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ICOS

## Strategy for linking with other data centers

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## Introduction

The ICOS project application (Annex 1) proposes to establish a web-based interface for accessing the data generated by the ICOS project (“Carbon Portal”). A prototype Carbon Portal developed during the current ICOS preparatory phase will be succeeded by a full-scale Carbon Portal in the operational phase of ICOS.

One important function of the full-scale Carbon Portal is to provide complementary information, in particular remote sensing observations and land use and fossil fuel emission data, in an end-user oriented fashion for dissemination and outreach.

## Scenarios of integration of external data in Carbon Portal

Considering the goal of ICOS, the interests of users, and the requirements by international coordinating programs (GCOS, GEOSS), we offer four scenarios for external data integration. In all scenarios, ICOS data will also have to be provided to global data centres due to GOSC requirements. The carbon portal also needs regular maintenance by inclusion of new projects and new data providers whose data complement and by severing links to projects that no longer supply appropriate data. Some functions, e.g., data archiving, data integrity, data migration, access to data and metadata, and submission of data to world data centres, may be outsourced and run by other European infrastructure projects (GENESI-DR).

**A) *The Carbon Portal is the outlet for ICOS data. It is hosted and operated by an external organization (e.g. ECMWF, FAO, JRC) that already owns, hosts or has access to relevant complementary data.***

⊖ Not in line with ICOS DoW. Low visibility of ICOS.

⊕ Low effort. Expertise of other data portals is used. Synergy effects possible. Other data centres strengthened.

**B) *The Carbon Portal is the outlet for ICOS data. As a service for data users the portal also provides gateways (e.g. online links) to external data. The portal is part of the ICOS infrastructure.***

ICOS data are presented without interpretation (e.g. graphs of measured variables of each site over time, descriptive statistics).

Gateways to other data sets or portals must be checked regularly.

⊕ Feasible now, additional services can be added later.

⊖ Great overlap with existing or emerging data portals (GEOMon, GEO Portal, GOSIC, COCOS) or multiple data owners (ECMWF, FAO, JRC). Global carbon portals may supersede ICOS portal.

⊖ External data providers may not be interested in making their data structure compatible with the Carbon Portal.

**C) *The Carbon Portal will be the primary source for European carbon budget data. Users generate or view carbon budget maps online. The extra service makes it attractive for external data providers to integrate their data in the Carbon Portal. The Carbon Portal is part of the ICOS infrastructure.***

ICOS data are processed to a high degree and combined with external data.

External data can be accessed directly from external databases or are hosted by ICOS.

ICOS provides the science and software to allow user-defined evaluations.

⊕ Attractive user service, seed for global carbon portal.

⊖ Requires advanced modelling activity

⊖ Goes beyond ICOS' DoW.

D) *The Carbon Portal is maintained by an ICOS member (country or organization) acting like an external host. Member supplies external "Data Thematic Center" (similar to North-American Carbon Program (nacp.ornl.gov/mast-dc) with WebGIS functions and budget capabilities. The carbon portal could be inside or outside the ICOS infrastructure.*

Member provides the science and software to allow user-defined or preconfigured evaluations.

⊕ Attractive user experience.

⊕ Strengthening of existing structures. ICOS DoW compliant.

### Strategy for linking with other data centres

Each of the above scenarios has different consequences for the personnel and infrastructure resources necessary to run the Carbon Portal. So far, it has been planned that the carbon portal is linked to the Co-ordinating Office. Depending on the choice of carbon portal scenario, different costs are involved for the Co-ordinating Office. ICOS data need not be hosted by the Carbon Portal but may be hosted internally or externally (e.g. GENESI-DR) and are accessed through the Carbon Portal and must conform to Carbon Portal requirements.

Several agencies and projects are currently preparing or expanding web-based portals for data access. These include COCOS, ECMWF, EEA, ESA, FAO, GeoMon, GEO-Portal, GMES, GOSIC, JRC, and the World Data Center system. Many of the portals provide links to sites from where the data can be downloaded.

For the Carbon Portal to stand out, it should provide direct data access and additional services, e.g., online budget calculations. For direct access WP4 would negotiate with data providers how intellectual property rights and usage conditions of individual providers could be preserved by single registration at the Carbon Portal. This, however, requires that ICOS can suggest a technical solution. Additional services would be in line of ICOS' DoW that calls for the Carbon Portal to support dissemination, outreach, and rich data delivery. Co-ordination with other European and global data centres is necessary to minimize overlap and establish common interfaces. The co-ordination of data providers seems to be necessary also at the global level and time to achieve this goal within the ICOS preparatory phase may be too short. Furthermore, the list and specifications of Essential Carbon Cycle Variables<sup>1</sup> should be harmonized with the Essential Climate Variables.

We recommend to target a Carbon Portal in collaboration with other (global) data centers that is loosely tied to the ICOS co-ordinating office in the operational phase (scenario B or D) and whose technical services are run by an institution with long-

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<sup>1</sup> previously called Essential Climate Variables; renamed to reduce confusion

term commitment. Especially the GeoMon portal would provide a great portion of the intended functionality of the Carbon Portal. Sharing portal functionality, common variable names harmonized with ECVs and ECCVs, and perhaps access negotiations would be desirable. Budget calculation as a Carbon Portal service may be added later and independent of data access when a budget model is mature enough. Currently it does not seem appropriate to approach data providers with demands and a data portal concept that has not been formally adopted by ICOS. JRC, e.g., is awaiting a clear concept of the Carbon Portal before committing to data release. A clear concept for the Carbon Portal is also necessary to make it attractive for other data owners so that they allow direct access and possibly reformat data or metadata.

### **Contacts with external data providers**

See ICOS document M4.1 (Köchy, M., and A. Freibauer. 2010. Meeting with important data owners. ICOS Report M4.1. Johann Heinrich von Thünen-Institut, Institut für Agrarrelevante Klimaforschung, Braunschweig, Germany).

### **CarbonPortal functions**

Based on scenario B and building on the example of the GeoMon Portal, the Carbon Portal should have the following functions:

- allow selection of data or model results by applying database filters (variable, project, type, platform, domain, temporal range, spatial range/location, quality level)
- allow machine-search of ICOS metadata (e.g. by using the DIF or SERF protocols)
- allow download of unrestricted ICOS data after registration  
the metadata of each data set will include the information according to the INSPIRE Metadata regulation (<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008R1205:EN:NOT>) plus data usage policy, version, STD-DOI, and numerical fingerprint
- allow download of ancillary data, if data are directly accessible; provide link to data portal, if data owner uses access restrictions
- allow plotting of time series of ICOS data for individual sites
- provide maps of ICOS sites
- possibly provide additional services to users later (descriptive statistics, spatial interpolation, WebGIS functions, budget calculators)

By using the appropriate filter combinations it would be possible to access (if allowed by the respective intellectual property rights holder)

- data measured within ICOS,
- data measured outside ICOS,
- results of models

A great variety of model results and external data may be of interest to potential users of the Carbon Portal (Appendix 1). Therefore, the Carbon Portal can initially list only a selection of items. Users should have the possibility to suggest data sets

or models to extend the Carbon Portal. The Carbon Portal maintainer or the ICOS central office would review the suitability of the suggestion and then include it in the portal.

**GEOmon Distributed Data Base**  
An Atmospheric data portal

This is a web portal that allows you to search for atmospheric composition data from a multitude of data archives through a single user interface. For some of the databases, the interface furthermore allows you to download data.

Home  
Project  
Data Info  
**Data Base**  
Science  
Outreach  
Contacts  
Internal

**How to use this site**

**Component (Info)**  
>>All  
aerosol.absorption.coefficient  
aerosol.backscatter.coefficient  
aerosol.backscatter.coefficient.hemispheric  
aerosol.backscatter.ratio  
aerosol.depolarisation.coefficient  
aerosol.depolarisation.ratio  
aerosol.extinction.coefficient  
aerosol.extinction.ratio  
aerosol.optical.depth

**Location (Info)**  
>>All  
Abastumani  
Aberdeen  
Aberystwyth  
Abisko  
Acadia  
Acadia.national.park-Mc.Farland.hill  
Achenkirch  
Addison.pinnacle  
Adrigole

**Database (Info)**  
>>All  
AMAP  
AVDC  
CARIBIC-GEOMON  
CREATE  
EARLINET  
EMEP  
EMEP-CAMPAIGNS  
EMEP-GAW  
ESA-CDB

**Type (Info)**  
>>All  
insitu  
numerical.simulation  
remote.sensing  
sample  
undefined

**Platform (Info)**  
>>All  
aircraft  
assimilation  
balloon  
groundbased  
satellite  
ship  
undefined

**Matrix (Info)**  
>>All  
aerosol  
air  
met  
ocean  
pm\_eq110  
pm\_eq165  
pm\_eq265  
pm\_eq35  
pm\_eq50

Available datasets: 598061

Latitude: From  To   
Longitude: From  To   
Altitude: From  To   
Date: From  To

List Datasets Reset

Access GEOmon rapid delivery data here

## Next steps

Discussion of Carbon Portal functions, intensity of integration of external data, and additional services at the ICOS annual meeting 2010.

Formal adoption of Carbon Portal functions and integration of external data by Executive Board till September 2010.

Depending on the adopted Carbon Portal scenario, contacting of data owners, providers, hosts or portals for direct linking to data or sharing of services.

Filling of Carbon Portal including feedback by users (WP8).

Revision of Report D4.4 “Existing data gaps”.

**Appendix 1: Carbon related projects, studies, and organizations**

The following list is non-exhaustive. The authors are grateful for information about not yet listed projects of European or global relevance.

	An Inventory of Data, for Reconstructing 'Natural Steady State' Carbon Storage in Terrestrial Ecosystems	<a href="http://www.esd.ornl.gov/projects/gen/carbon1.html">http://www.esd.ornl.gov/projects/gen/carbon1.html</a>
	Dutch National System for greenhouse gas balance of the Land use sector. Datawarehouse Emission Inventory	<a href="http://www.broeikasgassen.nl/">http://www.broeikasgassen.nl/</a>
	Estimation of organic Carbon in the forest soils of Spain – applied to the Valencia region	
	Evaluation of the SOM accumulation capability of Mediterranean soils	
	Forest Carbon Sinks and Economic Costs of Kyoto Protocol	<a href="http://www.metla.fi/hanke/3306/index-en.htm">http://www.metla.fi/hanke/3306/index-en.htm</a>
	Integrated Method to Estimate the Carbon Budget of Forests	<a href="http://www.efi.fi/projects/integrated/main.html">http://www.efi.fi/projects/integrated/main.html</a>
	Modelling forest carbon cycles	<a href="http://www.metla.fi/hanke/3323/index-en.htm">http://www.metla.fi/hanke/3323/index-en.htm</a>
	Pools and fluxes of carbon on mineral soils and peatlands	<a href="http://www.metla.fi/hanke/3324/index-en.htm">http://www.metla.fi/hanke/3324/index-en.htm</a>
	Sediment discharge from European rivers	<a href="http://www.eea.europa.eu/data-and-maps/data/sediment-discharges">http://www.eea.europa.eu/data-and-maps/data/sediment-discharges</a>
	Soil carbon fluxes and land use change: modelling component for the National carbon dioxide inventory	<a href="http://www.rothamsted.bbsrc.ac.uk/aen/ukcarbon/index.htm">http://www.rothamsted.bbsrc.ac.uk/aen/ukcarbon/index.htm</a>
	UK Emissions by Sources and Removals by Sinks due to Land Use, Land Use Change and Forestry Activities	<a href="http://www.nbu.ac.uk/ukcarbon/">http://www.nbu.ac.uk/ukcarbon/</a>
AEROCARB	Airborne European Regional Observations of the Carbon Balance	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/aer.html">http://www.bgc-jena.mpg.de/public/carboeur/projects/aer.html</a>
AFFOREST	Afforestation management in north-western Europe - influence on nitrogen leaching, groundwater recharge, and carbon sequestration	<a href="http://www.fsl.dk/afforest/">http://www.fsl.dk/afforest/</a>
AGGI	Annual Greenhouse Gas Index	<a href="http://www.esrl.noaa.gov/gmd/aggi">http://www.esrl.noaa.gov/gmd/aggi</a>
AIMES	Analysis, Integration and Modeling of the Earth System	<a href="http://www.aimes.ucar.edu">http://www.aimes.ucar.edu</a> , <a href="http://www.ghginstitute.org">http://www.ghginstitute.org</a>
AIRBASE		<a href="http://air-climate.eionet.europa.eu/databases/airbase/">http://air-climate.eionet.europa.eu/databases/airbase/</a>
AmeriFlux	AmeriFlux	<a href="http://public.ornl.gov/ameriflux">http://public.ornl.gov/ameriflux</a>
ATSR Fire Atlas		
Australian National Carbon Accounting System	National Carbon Accounting System	<a href="http://www.greenhouse.gov.au/ncas/">http://www.greenhouse.gov.au/ncas/</a>
Black Carbon Reference Material	Black Carbon Reference Material	<a href="http://www.geo.unizh.ch/physics/bc/">http://www.geo.unizh.ch/physics/bc/</a>
BOREAS	Boreal Ecosystem-Atmosphere Study	<a href="http://www-eosdis.ornl.gov/BOREAS/bhs/BOREAS_Home.html">http://www-eosdis.ornl.gov/BOREAS/bhs/BOREAS_Home.html</a>
C-DAS	Carbon Data-Model Assimilation Summer Institute	<a href="http://dataportal.ucar.edu/CDAS/">http://dataportal.ucar.edu/CDAS/</a>
C4MIP	Coupled Climate, Carbon Cycle Model Intercomparison Project	<a href="http://www.c4mip.cnrs-gif.fr/background.html">http://www.c4mip.cnrs-gif.fr/background.html</a>
CAMELS	Carbon Assimilation and Modelling of the European Land-Surface	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/camels.htm">http://www.bgc-jena.mpg.de/public/carboeur/projects/camels.htm</a> , <a href="http://www.efi.fi/projects/project.phtml?id=5004">http://www.efi.fi/projects/project.phtml?id=5004</a>
CARBAL	The effect of management strategies on greenhouse gas balances in industrial cutaway peatland	<a href="http://www.ucd.ie/ferg/Research/Projects/CARBAL.html">http://www.ucd.ie/ferg/Research/Projects/CARBAL.html</a>
CarbiFor	Carbon sequestration of the Irish forest ecosystem	<a href="http://www.ucd.ie/carbifor/index.htm">http://www.ucd.ie/carbifor/index.htm</a>
CARBOAGE	Age-related Dynamics of Carbon Exchange in European Forests	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/cag.html">http://www.bgc-jena.mpg.de/public/carboeur/projects/cag.html</a> , <a href="http://www.ierm.ed.ac.uk/CARB-AGE/HOME.htm">http://www.ierm.ed.ac.uk/CARB-AGE/HOME.htm</a>

CARBODATA	Carbon Balance Estimates and Resource Management - Support with Data from Project Networks Implemented at European Continental Scale	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/cda.html">http://www.bgc-jena.mpg.de/public/carboeur/projects/cda.html</a>
CARBOEUROFLUX	An investigation on Carbon and Energy exchanges of terrestrial ecosystems in Europe	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/cef.html">http://www.bgc-jena.mpg.de/public/carboeur/projects/cef.html</a>
CarboEurope Cluster	CarboEurope Cluster	<a href="http://www.bgc-jena.mpg.de/public/carboeur">http://www.bgc-jena.mpg.de/public/carboeur</a>
CARBOEUROPE GHG	Concerted action: Synthesis of the European Greenhouse Gas Budget	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/ghg.htm">http://www.bgc-jena.mpg.de/public/carboeur/projects/ghg.htm</a> , <a href="http://www.efi.fi/projects/project.phtml?id=5007">http://www.efi.fi/projects/project.phtml?id=5007</a>
CarboEurope IP	CarboEurope IP	<a href="http://www.carboeurope.org">http://www.carboeurope.org</a>
CARBOFOR	Quantification , prospective, and vulnerability of French forest carbon to climate change	<a href="http://www.carbofor.fr.st/">http://www.carbofor.fr.st/</a>
CARBOINVENT	Multi-source inventory methods for quantifying carbon stocks and stock changes in European forests	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/invent.htm">http://www.bgc-jena.mpg.de/public/carboeur/projects/invent.htm</a>
CARBOMONT	Effects of land-use changes on sources, sinks and fluxes of carbon in European mountain areas	<a href="http://CARBOMONT.uibk.ac.at/">http://CARBOMONT.uibk.ac.at/</a>
Carbon Footprint of Nations	Carbon Footprint of Nations	<a href="http://www.carbonfootprintofnations.com/index.php">http://www.carbonfootprintofnations.com/index.php</a>
Carbon Tracker	Carbon Tracker	<a href="http://carbontracker.noaa.gov">http://carbontracker.noaa.gov</a>
CarboNA	CarboNA	<a href="http://nacarbon.org/carbona/index.htm">http://nacarbon.org/carbona/index.htm</a>
CarboOcean IP	CarboOcean IP	<a href="http://www.carboocean.org">http://www.carboocean.org</a>
CASFOR-II	Modelling Carbon Sequestration in Forested Landscapes	<a href="http://www.efi.fi/projects/project.phtml?id=15581J">http://www.efi.fi/projects/project.phtml?id=15581J</a>
CASMOFOR	A country specific carbon accounting model to assess the amount of carbon sequestered in afforestations	<a href="http://www.scientia.hu/casmo-for/">http://www.scientia.hu/casmo-for/</a>
CASTEC	Carbon sequestration potential in different Belgian terrestrial ecosystems (Task Force 3: Forests and plantations)	<a href="http://allserv.rug.ac.be/~ovcl eemp/">http://allserv.rug.ac.be/~ovcl eemp/</a>
CCGGG	Carbon Cycle Greenhouse Gases Group	<a href="http://www.esrl.noaa.gov/gmd/ccgg">http://www.esrl.noaa.gov/gmd/ccgg</a>
CDIAC	Carbon Dioxide Information Analysis Center	<a href="http://cdiac.esd.ornl.gov">http://cdiac.esd.ornl.gov</a>
CHIOTTO	Continuous High-precision Tall Tower Observation of greenhouse gases	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/chiotto.htm">http://www.bgc-jena.mpg.de/public/carboeur/projects/chiotto.htm</a>
CLAMP		
CLIVAR	Climate Variability and Predictability	<a href="http://www.clivar.org">http://www.clivar.org</a>
CLIVAR CHS	CLIVAR-Carbon and Hydrographic Sections	<a href="http://www.clivar.org/carbon_hydro/">http://www.clivar.org/carbon_hydro/</a>
CMDL CCGG	Climate Modeling and Diagnostic Laboratory. Carbon Cycle and Greenhouse Gases	<a href="http://www.cmdl.noaa.gov">http://www.cmdl.noaa.gov</a>
CMI	Carbon Mitigation Initiative	<a href="http://www.princeton.edu/~c mi">http://www.princeton.edu/~c mi</a>
CMIP	Coupled Model Intercomparison Project	<a href="http://www-pcmdi.llnl.gov/projects/cmip/index.php">http://www-pcmdi.llnl.gov/projects/cmip/index.php</a>
CNTER	Carbon-nitrogen interactions in forest ecosystems	<a href="http://www.efi.fi/projects/project.phtml?id=15581J">http://www.efi.fi/projects/project.phtml?id=15581J</a>
COCOS		<a href="http://www.cocos-carbon.org/">http://www.cocos-carbon.org/</a>
CORINE	Land cover	<a href="http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2000-clc2000-100-m-version-12-2009">http://www.eea.europa.eu/data-and-maps/data/corine-land-cover-2000-clc2000-100-m-version-12-2009</a>
COST E21	Contribution of Forests and Forestry to Mitigate Greenhouse Effects	
COST E25	European Network for long-term Forest Ecosystem and Landscape Research	<a href="http://www.wsl.ch/projects/enfors/">http://www.wsl.ch/projects/enfors/</a>
CPF-CH	Assessment of Carbon Pools and Fluxes in Swiss Forests	<a href="http://www.rereth.ethz.ch/fowi/selb.bugmann/bugmann/pj.07.html">http://www.rereth.ethz.ch/fowi/selb.bugmann/bugmann/pj.07.html</a>



Csite	Carbon Sequestration in Terrestrial Ecosystems	<a href="http://csite.esd.ornl.gov/">http://csite.esd.ornl.gov/</a>
CzechRECAF	Carbon balance of forest ecosystems: regional assessment of carbon stock and modelling its change in relation to the Kyoto protocol requirements	<a href="http://www.ifer.cz/en/projects/detailed/1_2003/index.php?id=introduction">http://www.ifer.cz/en/projects/detailed/1_2003/index.php?id=introduction</a>
DOE TCP	Department of Energy Terrestrial Carbon Processes	<a href="http://www.science.doe.gov/ober/CCRD/tcp.html">http://www.science.doe.gov/ober/CCRD/tcp.html</a>
DROUGHT		<a href="http://edo.jrc.ec.europa.eu/php/index.php?action=view&amp;id=34">http://edo.jrc.ec.europa.eu/php/index.php?action=view&amp;id=34</a>
EARLINET	European Aerosol Research Lidar Network	<a href="http://www.earlinet.org/">http://www.earlinet.org/</a>
EBAS	EMEP Database	<a href="http://ebas.nilu.no/">http://ebas.nilu.no/</a>
EDGAR	Fossil Fuel Emissions	<a href="http://edgar.jrc.ec.europa.eu/index.php">http://edgar.jrc.ec.europa.eu/index.php</a>
EFFIS	Fire	<a href="http://effis.jrc.ec.europa.eu/">http://effis.jrc.ec.europa.eu/</a>
EMDI	Ecosystem Model Data Intercomparison	<a href="http://gaim.unh.edu/Structure/Intercomparison/EMDI/index.html">http://gaim.unh.edu/Structure/Intercomparison/EMDI/index.html</a>
EPOCA	European Project on Ocean Acidification	<a href="http://epoca-project.eu">http://epoca-project.eu</a>
ESA-CDB	European Space Agency – Campaign Database	<a href="http://nadir.nilu.no/cdb">http://nadir.nilu.no/cdb</a>
ESA-GlobCarbon	Remote sensing carbon related data	<a href="http://www.globcarbon.info">http://www.globcarbon.info</a>
ESSP	Earth System Science Partnership	
Eumetsat		<a href="http://landsaf.meteo.pt">landsaf.meteo.pt</a>
EUROSIBIRIAN-CARBONFLUX	a Feasibility Study to quantify Fluxes of Biogeochemical Trace Gases on a Regional and Continental Scale	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/eus.html">http://www.bgc-jena.mpg.de/public/carboeur/projects/eus.html</a>
FACE	Free Air Carbon Dioxide Enrichment	<a href="http://public.ornl.gov/face/index.shtml">http://public.ornl.gov/face/index.shtml</a>
FAO	United Nation Food and Agriculture Organisation	
FAPAR		<a href="http://fapar.jrc.ec.europa.eu/Home.php">http://fapar.jrc.ec.europa.eu/Home.php</a>
FCT	Forest Carbon Tracking	<a href="http://geo-fct.org">http://geo-fct.org</a>
FLUXNET	Fluxnet: Intergrating Worldwide CO Flux Measurements	<a href="http://www.fluxnet.ornl.gov/fluxnet">http://www.fluxnet.ornl.gov/fluxnet</a>
Fluxnet-Canada	Fluxnet-Canada	<a href="http://www.fluxnet-canada.ca">http://www.fluxnet-canada.ca</a>
FORCAST	Forest Carbon - Nitrogen Trajectories	<a href="http://www.bgc-jena.mpg.de/public/carboeur/Forecast/index_for.html">http://www.bgc-jena.mpg.de/public/carboeur/Forecast/index_for.html</a>
Forest Carbon Accounting	Forest Carbon Accounting	<a href="http://carbon.cfs.nrcan.gc.ca/index_e.html">http://carbon.cfs.nrcan.gc.ca/index_e.html</a>
ForSite Carbon	ForSite Carbon	<a href="http://www.ibw.vlaanderen.be/eng/bossen/standpl/text/project.html">http://www.ibw.vlaanderen.be/eng/bossen/standpl/text/project.html</a>
GAIM	Global Analysis, Integration, and Modelling	<a href="http://gaim.unh.edu">http://gaim.unh.edu</a>
GAWSIS		<a href="http://gaw.empa.ch/gawsis/">http://gaw.empa.ch/gawsis/</a>
GCOS	Global Climate Observation System	<a href="http://www.wmo.ch/web/gcos/gcoshome.html">http://www.wmo.ch/web/gcos/gcoshome.html</a>
GCP	Global Carbon Project	<a href="http://www.globalcarbonproject.org">http://www.globalcarbonproject.org</a>
GCTE	Global Change and Terrestrial Ecosystems	<a href="http://www.gcte.org">http://www.gcte.org</a>
GEMS		<a href="http://gems.ecmwf.int/">http://gems.ecmwf.int/</a>
GEO-Portal		<a href="http://www.earthobservations.org/pr_popr.shtml">http://www.earthobservations.org/pr_popr.shtml</a>
GeoMon		<a href="http://dev0.nilu.no/geomon/">http://dev0.nilu.no/geomon/</a>
GEOSEC	oceanic	
GEOSEC II	oceanic	
GEOTRACES	oceanic	
GEWEX	Global Energy and Water Cycle Experiment	<a href="http://www.gewex.org">http://www.gewex.org</a>
GFMC	Global Fire Monitoring Center	<a href="http://www.fire.uni-freiburg.de">http://www.fire.uni-freiburg.de</a>
GHG Europe	Greenhouse Gas Management in European Land Use Systems	<a href="http://www.ghg-europe.eu">http://www.ghg-europe.eu</a>
Global Land Cover 2000		<a href="http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.ph">http://bioval.jrc.ec.europa.eu/products/glc2000/glc2000.ph</a>
Global Land Remote Sensing	Global Land Remote Sensing	<a href="http://remotesensing.unh.edu">http://remotesensing.unh.edu</a>

GLOBALVIEW	GLOBALVIEW— Cooperative Atmospheric Data Integration Project on CO <sub>2</sub> measurements	<a href="http://remotesensing.unh.edu">http://remotesensing.unh.edu</a>
GlobWetland		<a href="http://www.globwetland.org/">http://www.globwetland.org/</a>
GMES Forest		<a href="http://www.gmes-forest.info/">http://www.gmes-forest.info/</a>
GMES-GeoLand	Geoland Carbon Observatory	<a href="http://www.gmes-geoland.info/OS/ONC/index.php">http://www.gmes-geoland.info/OS/ONC/index.php</a>
GMES-GSE		<a href="http://www.gmes-forest.info/pages/po_prod_stats.htm">http://www.gmes-forest.info/pages/po_prod_stats.htm</a>
GOSAT-JAXA	satellite	
GOSIC		<a href="http://www.gosic.org">www.gosic.org</a>
GREENGRASS	Sources and Sinks of Greenhouse Gases from managed European Grasslands and Mitigation Strategies	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/green.htm">http://www.bgc-jena.mpg.de/public/carboeur/projects/green.htm</a>
GSmag		<a href="http://www.radar.aero.osaka-fu-u.ac.jp/~gsmag/pdf/ISAP2007/isap2007okamoto.pdf">http://www.radar.aero.osaka-fu-u.ac.jp/~gsmag/pdf/ISAP2007/isap2007okamoto.pdf</a>
GTOS/TCO/CEE	Global Terrestrial Observing System - Terrestrial Carbon Observations - Central and Eastern Europe programme	<a href="http://www.fao.org/gtos/CEE.html">http://www.fao.org/gtos/CEE.html</a>
HWSD	Harmonized World Soil Database	<a href="http://www.iiasa.ac.at/Research/LUC/luc07/External-World-soil-database/HTML/">http://www.iiasa.ac.at/Research/LUC/luc07/External-World-soil-database/HTML/</a>
ICES KIS	Klimaat Programma: "Climate Changes Spatial Planning" Program	<a href="http://www.falw.vu.nl/iceskis/program/index-nl.html">http://www.falw.vu.nl/iceskis/program/index-nl.html</a>
ICP Forest		
IGACO		
IGBP	International Geosphere - Biosphere Programme	<a href="http://www.igbp.net">http://www.igbp.net</a>
IGBP-LOICZ		
IGCO	Integrated Global Carbon Observation	<a href="http://ioc.unesco.org/igospartners/Carbon.htm">http://ioc.unesco.org/igospartners/Carbon.htm</a>
IHDP	International Human Dimensions Programme on Global Environmental Change	<a href="http://www.ihdp.org">http://www.ihdp.org</a>
ILAMP		
IMBER	Integrated Marine Biogeochemistry and Ecosystem Research	<a href="http://www.imber.info">http://www.imber.info</a>
	Integrated Marine Biogeochemistry and Ecosystem Research (IMBER)	<a href="http://www.imber.info">http://www.imber.info</a>
IMECC	Infrastructure for the Measurement of the European Carbon Cycle	
INFOCARB	Carbon Fluxes and Pools in Forest Ecosystems	<a href="http://www.cealp.it/">http://www.cealp.it/</a>
INSEA	Integrated Sink Enhancement Assessment	<a href="http://www.iiasa.ac.at/docs/Research/">http://www.iiasa.ac.at/docs/Research/</a>
IOCCP	International Ocean Carbon Coordination Project	<a href="http://www.ioccp.org">http://www.ioccp.org</a>
JGOFS	Joint Global Ocean Flux Study	<a href="http://ijgofs.whoi.edu/">http://ijgofs.whoi.edu/</a>
JRC	Joint Research Commission	
Landflux		
LBA - CARBONSINK	The Future of the Tropical Forest Carbon Sink European Contribution to the Large-scale Biosphere-Atmosphere Experiment in Amazonia: Carbon Cycle	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/lba.html">http://www.bgc-jena.mpg.de/public/carboeur/projects/lba.html</a>
LDEO (Takahashi) data base	LDEO (Takahashi) data base	<a href="http://cdiac.ornl.gov/oceans/LDEO_Underway_Database/LDEO_home.html">http://cdiac.ornl.gov/oceans/LDEO_Underway_Database/LDEO_home.html</a>
LUSTRA	Sweden	<a href="http://www-sml.slu.se/lustra/mainproj.html">http://www-sml.slu.se/lustra/mainproj.html</a>
MACC	Monitoring Air Composition and Climate	<a href="http://www.gmes-atmosphere.eu/">http://www.gmes-atmosphere.eu/</a> , <a href="http://data-portal.ecmwf.int/data/d/gems_reanalysis/">http://data-portal.ecmwf.int/data/d/gems_reanalysis/</a>
MARS for LULUCF	Monitoring, Accounting & Reporting Systems for Land Use, Land Use Change and Forestry	<a href="http://www.ec.gc.ca/pdb/ghg/mars_steering_committee_e.cfm">http://www.ec.gc.ca/pdb/ghg/mars_steering_committee_e.cfm</a>
MASCAREF	Study under EEC 2152/2003 Forest Focus regulation on developing harmonized methods for assessing carbon sequestration in European forests	<a href="http://www.ifer.cz/oddeleni/index.php?page=project_running_detail&amp;id=82007">http://www.ifer.cz/oddeleni/index.php?page=project_running_detail&amp;id=82007</a>

MEACAP	Impact of Environmental Agreements on the CAP	<a href="http://www.alterra.nl/">http://www.alterra.nl/</a>
Medokads		<a href="http://imk-msa.fzk.de/Projects/AVHRR_1km/index.htm">http://imk-msa.fzk.de/Projects/AVHRR_1km/index.htm</a>
MERSEA		
METAGE	Modelling Ecosystem TrAce Gas Emissions	<a href="http://www.geo.ucl.ac.be/metage/">http://www.geo.ucl.ac.be/metage/</a>
MODIS Land Products	MODIS Land Products	<a href="http://modis-land.gsfc.nasa.gov">http://modis-land.gsfc.nasa.gov</a>
NACP	North American Carbon Program	<a href="http://www.nacarbon.org">http://www.nacarbon.org</a>
NASA CCE	National Aeronautics and Space Administration: Carbon Cycle and Ecosystems	<a href="http://science.hq.nasa.gov/earth-sun/science/carbon.html">http://science.hq.nasa.gov/earth-sun/science/carbon.html</a>
NCAR	National Center for Atmospheric Research	<a href="http://www.ncar.ucar.edu">http://www.ncar.ucar.edu</a>
NDACC	Network for Detection of Atmospheric Composition Change	<a href="http://www.ndsc.ncep.noaa.gov/data/">http://www.ndsc.ncep.noaa.gov/data/</a>
NGCRP	Northern Global Change Research Program	<a href="http://www.fs.fed.us/ne/global/">http://www.fs.fed.us/ne/global/</a>
NICABO	Nitrogen and carbon storages in boreal soils and fluxes to water courses: present status and changes in relation to climate change	<a href="http://figare.utu.fi/info.html">http://figare.utu.fi/info.html</a>
NitroEurope		<a href="http://www.nitroeuropa.eu/">http://www.nitroeuropa.eu/</a>
NNCDMTE	Nordic Network for Carbon Dynamics in Managed Terrestrial Ecosystems	<a href="http://www-carbonsweden.slu.se/norfa/index_en.html">http://www-carbonsweden.slu.se/norfa/index_en.html</a>
NOAA CPO GCC	National Oceanic and Atmospheric Administration (NOAA) Climate Program Office - Global Carbon Cycle	<a href="http://www.climate.noaa.gov/cpo_pa/gcc">http://www.climate.noaa.gov/cpo_pa/gcc</a> , <a href="http://www.aoml.noaa.gov/ocd/oaces/">http://www.aoml.noaa.gov/ocd/oaces/</a>
NOAA GCC PMEL	Global Carbon Cycle Program from the Pacific Marine Environmental Laboratory	<a href="http://www.pmel.noaa.gov/co2/">http://www.pmel.noaa.gov/co2/</a>
NRP	Dutch National Research Programme on Global Air Pollution and Climate Change	<a href="http://www.nop.nl/">http://www.nop.nl/</a>
OCB	Ocean Carbon and Biogeochemistry	<a href="http://www.us-ocb.org">http://www.us-ocb.org</a>
OCMIP	Ocean Carbon-Cycle Model Intercomparison Project	<a href="http://www.ipsl.jussieu.fr/OCMIP">http://www.ipsl.jussieu.fr/OCMIP</a>
OCO	Orbiting Carbon Observatory	<a href="http://oco.jpl.nasa.gov">http://oco.jpl.nasa.gov</a>
ORCHIDEE	Organizing Carbon and Hydrology in Dynamic Ecosystems	<a href="http://www.ipsl.jussieu.fr/~ssi/psl/">http://www.ipsl.jussieu.fr/~ssi/psl/</a>
PESERA		<a href="http://eu soils.jrc.ec.europa.eu/ESDB_Archive/pesera/pesera_cd">http://eu soils.jrc.ec.europa.eu/ESDB_Archive/pesera/pesera_cd</a>
PICES PICNIC	PICES – CO Related Data Integration for the North Pacific	<a href="http://picnic.pices.jp">http://picnic.pices.jp</a>
RAMCES		
RECAP	Regional Assessment and Modelling of the Carbon Balance of Europe	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/rec.html">http://www.bgc-jena.mpg.de/public/carboeur/projects/rec.html</a>
RECCAP	REgional Carbon Cycle Assessment and Processes	<a href="http://www.globalcarbonproject.org/activities/RECCAP.htm">http://www.globalcarbonproject.org/activities/RECCAP.htm</a>
SCOR-IOC-IAEA-IGBP Ocean Acidification Network	SCOR-IOC-IAEA-IGBP Ocean Acidification Network	<a href="http://www.ocean-acidification.net/">http://www.ocean-acidification.net/</a>
SeaWiFS		<a href="http://marine.jrc.ec.europa.eu/index.php?module=pagemaster&amp;PAGE_user_op=view_page&amp;PAGE_id=20&amp;MMN_position=26:22">http://marine.jrc.ec.europa.eu/index.php?module=pagemaster&amp;PAGE_user_op=view_page&amp;PAGE_id=20&amp;MMN_position=26:22</a>
SILVISTRAT	Silvicultural Response Strategies to Climatic Change in Management of European Forest	<a href="http://www.efi.fi/projects/silvistrat/">http://www.efi.fi/projects/silvistrat/</a>
SMOS	Soil Moisture	<a href="http://edo.jrc.ec.europa.eu/php/index.php?action=view&amp;id=19">http://edo.jrc.ec.europa.eu/php/index.php?action=view&amp;id=19</a>
SOCCR	State of the Carbon Cycle Report	<a href="http://cdiac.ornl.gov/SOCCR">http://cdiac.ornl.gov/SOCCR</a>
SPADE 2	Surface Ocean Lower Atmosphere Study	<a href="http://www.wipac.jrc.ec.europa.eu/projects/spade/Doc_Appl.html">http://www.wipac.jrc.ec.europa.eu/projects/spade/Doc_Appl.html</a>
TACOS – Infrastructure	Terrestrial and Atmospheric Carbon Observing System Infrastructure	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/tacos.htm">http://www.bgc-jena.mpg.de/public/carboeur/projects/tacos.htm</a>

TCO	GTOS-Terrestrial Carbon Observation Initiative	<a href="http://www.fao.org/gtos/TCO.html">http://www.fao.org/gtos/TCO.html</a>
TCOS SIBERIA	Terrestrial Carbon Observing System - Siberia	<a href="http://www.bgc-jena.mpg.de/public/carboeur/projects/tcos.htm">http://www.bgc-jena.mpg.de/public/carboeur/projects/tcos.htm</a>
The Greenhouse Institute	The Greenhouse Institute	<a href="http://www.ghginstitute.org">http://www.ghginstitute.org</a>
Transcom	Atmospheric Tracer Transport Model Intercomparison Project	<a href="http://www.purdue.edu/transcom">http://www.purdue.edu/transcom</a>
TTO	<i>oceanic</i>	
UCFM	Ukrainian Carbon Forestry Monitoring	<a href="http://oregonstate.edu/~peremysv/ukraine/monitoring.htm">http://oregonstate.edu/~peremysv/ukraine/monitoring.htm</a>
UNEP		<a href="http://www.grid.unep.ch/data/data.php">http://www.grid.unep.ch/data/data.php</a>
UNEP Geodata		<a href="http://geodata.grid.unep.ch/extras/datasetlist.php">http://geodata.grid.unep.ch/extras/datasetlist.php</a>
UNFCCC	United Nations Framework Convention on Climate Change	<a href="http://unfccc.int/2860.php">http://unfccc.int/2860.php</a>
VITO		<a href="http://www.vito.be/english/index.htm">http://www.vito.be/english/index.htm</a>
WCRP	World Climate Research Program	<a href="http://wcrp.wmo.int">http://wcrp.wmo.int</a>
WMO	World Meteorology Organization	
WOCE	<i>oceanic</i>	