


Mapping vulnerability to climate change in the Nordic region: Introduction to the CARAVAN project

Timothy Carter

Finnish Environment Institute (SYKE)

on behalf of the project team



Caravan

**Climate change: a regional assessment of vulnerability
and adaptive capacity for the Nordic countries**



Climate Impact Research Coordination
for a Larger Europe

Nordic Call: 2008-2010



***Caravan* is funded within the Nordic-Call of the CIRCLE ERA-Net (Climate Impact Research Coordination for a Larger Europe).**

CIRCLE seeks to implement a European Research Area (ERA) for the field of climate change, through networking and by aligning national research.



Climate change: a regional assessment of vulnerability and adaptive capacity for the Nordic countries

Caravan Partners



Co-ordination

Finnish Environment Institute (SYKE), Helsinki

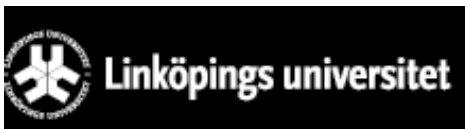
Timothy Carter, Stefan Fronzek, Maria Holmberg,

Aino Inkinen, Jari Lyytimäki, Hanna Mela, Aila Riihentausta



**The Department of Sociology and Human Geography,
University of Oslo (UiO)**

**Karen O'Brien, Siri Eriksen, Siri Mittet, Lynn Rosentrater,
Linda Sygna; Ida Skivenes, Cathrine Ruud**



**The Centre for Climate Science and Policy, Linköping
University (LIU)**

Louise Simonsson

Aim of Caravan

To compare and contrast alternative approaches to quantifying regional vulnerability to climate change in the Nordic region with a view to conducting more detailed vulnerability assessments in follow-up national and Nordic studies

Duration: July 2008 – December 2010

Budget: 148,000 Euro



The process of adaptation to climate change



Potentials of and Limits to Adaptation in Norway



Map-based assessment of vulnerability to climate change employing regional indicators

stakeholder partners



Lapland: **Antti Hannukkala**, MTT Plant Production Research, Rovaniemi; **Maiju Hyry**, Regional Council of Lapland, Rovaniemi; **Kaija Kinnunen**, MTK Lappi (Central Union of Agricultural Producers and Forest Owners), Rovaniemi; **Matti Ylimommo**, ProAgria Lappi, Rural Advisory Service, Rovaniemi

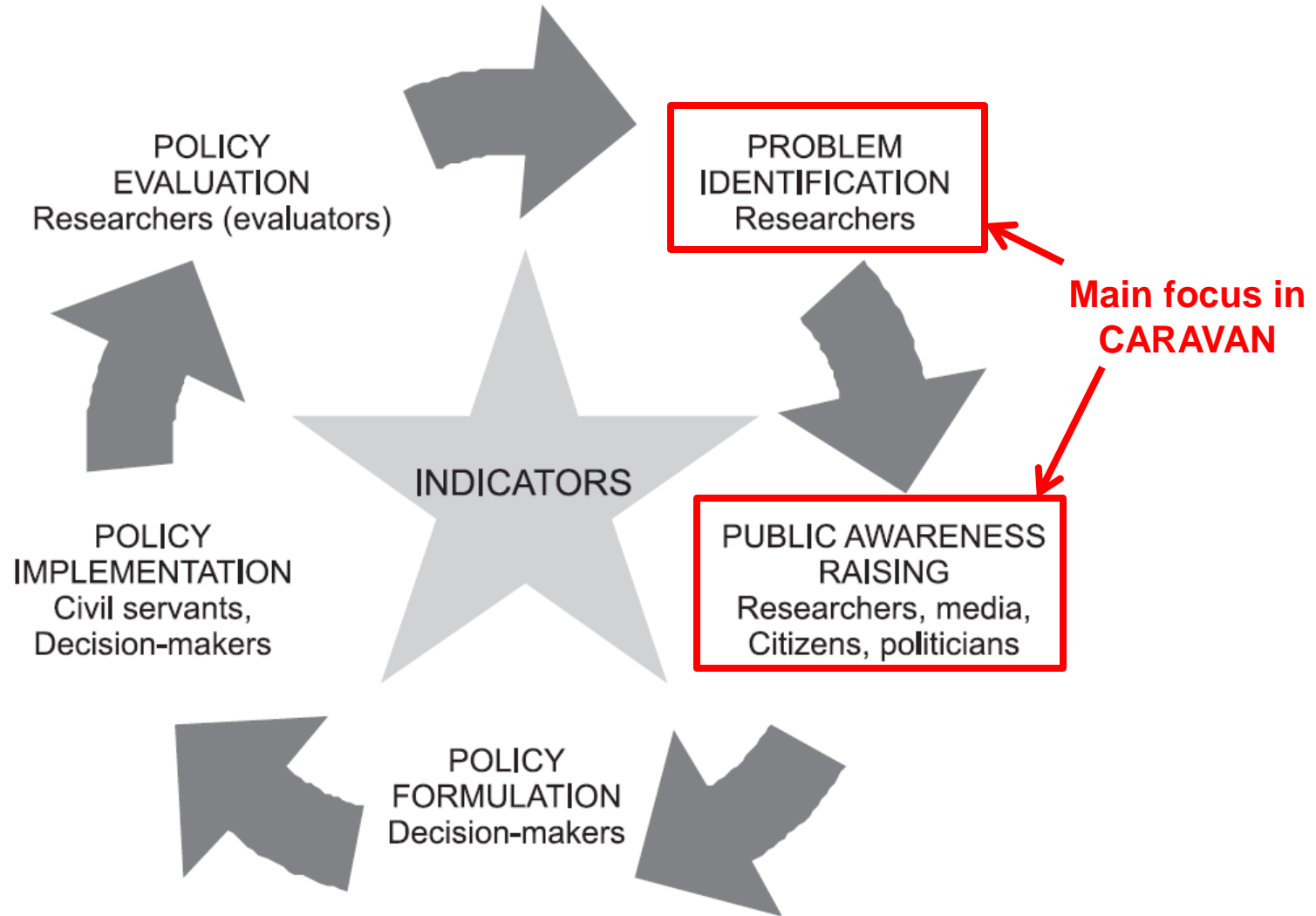


North-Savo: **Miranda Loh**, National Institute for Health and Welfare, Kuopio; **Henrik Rissanen/Paula Qvick**, North-Savo Regional Council, Kuopio; **Perttu Virkajärvi**, MTT Maaninka



Southwest Finland & Uusimaa: **Timo Juvonen** and **Pekka Ojanen**, Regional Council of Southwest Finland, Turku; **Juha Helenius**, University of Helsinki; **Susanna Kankaanpää**, Helsinki Metropolitan Area Council (YTV), Helsinki; **Pertti Rauhio/Silja Aalto**, Uusimaa Regional Council, Helsinki; **Sari Tollet**, The Finnish Ski Area Association, Helsinki

The policy cycle and the use of indicators



Source: Rosenström 2009 (modified from Moldan 1997)

Vulnerability

"The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes"

Source: IPCC (2001)

Vulnerability to climate change is a function of:

- exposure (E)
- sensitivity (S)
- adaptive capacity (A)

$$V = f (E, S, A)$$

Metzger and Schröter (2006)

Rankings of 100 Countries by descending vulnerability

Lowest Third

Sierra-Leone
Bangladesh
Somalia
Mozambique
Ethiopia
Rwanda
Benin
Yemen
Angola
Kenya
Senegal
Nigeria
Uganda
Madagascar
Sudan
Nepal
Haiti
Guatemala
Syria
Kuwait
Swaziland
Zimbabwe
Pakistan
S-Africa
Ghana
Nicaragua
India
Congo
Morocco
Honduras
El-Salvador
Cameroon
Dominican-Republic

Middle Third

Cambodia
Iran
Iraq
Viet-Nam
Peru
Bolivia
Tunisia
Mexico
Paraguay
Algeria
Philippines
Brazil
Jordan
Sri-Lanka
Lebanon
China
Egypt
Gabon
Saudi-Arabia
Libya
Kyrgyzstan
Ecuador
Indonesia
Uruguay
Jamaica
Thailand
Colombia
Chile
Panama
Turkey
Costa-Rica
Malaysia
Argentina
Venezuela

Highest Third

Trinidad-and-Tobago
Papua-New-Guinea
Ukraine
Iceland
Romania
Poland
Hungary
Albania
Israel
Greece
Portugal
UK
Bulgaria
S-Korea
Ireland
Belarus
Spain
New-Zealand
Australia
Netherlands
United Arab Emirates
Italy
Belgium
Denmark
USA
France
Austria
Japan
Canada
Switzerland
Sweden
Finland
Norway

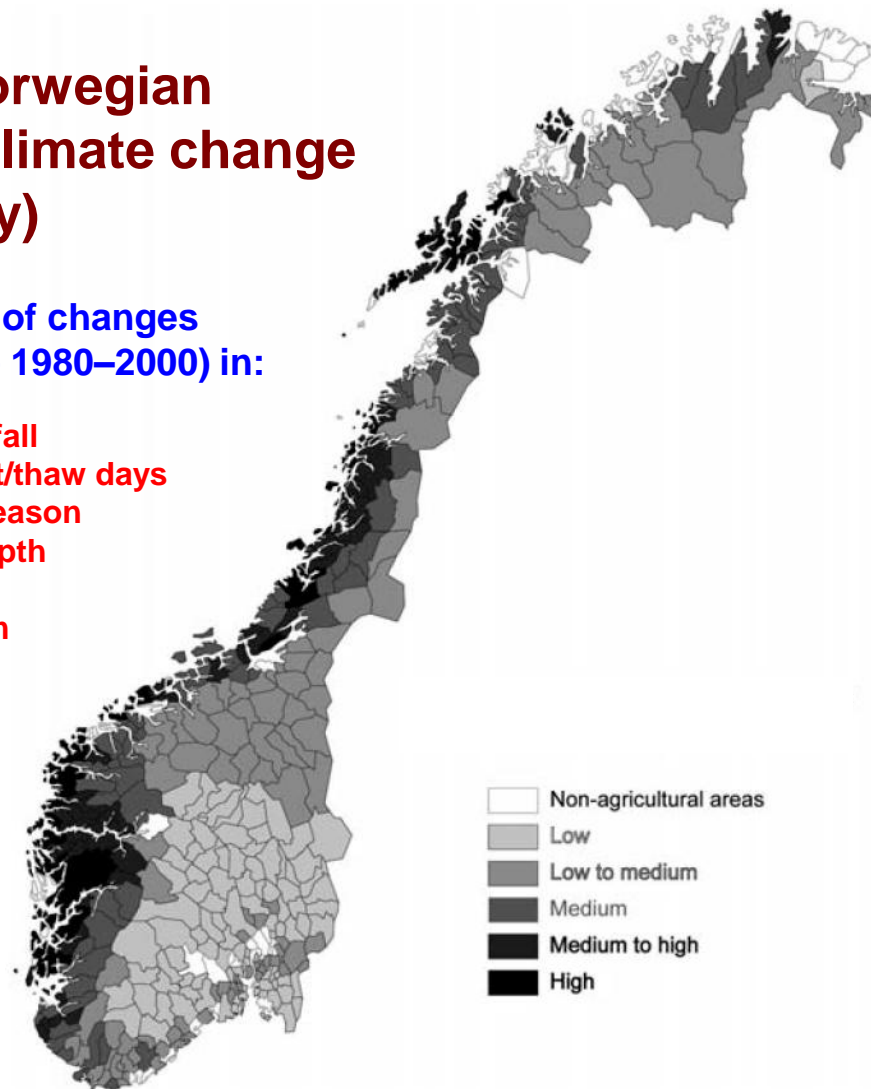
Source: Yohe et al. (2006)

Exposure of Norwegian agriculture to climate change (by municipality)

Defined as a function of changes (2030–2050 relative to 1980–2000) in:

- spring and autumn rainfall
- spring and autumn frost/thaw days
- length of the growing season
- average winter snow depth

Projections from RegClim

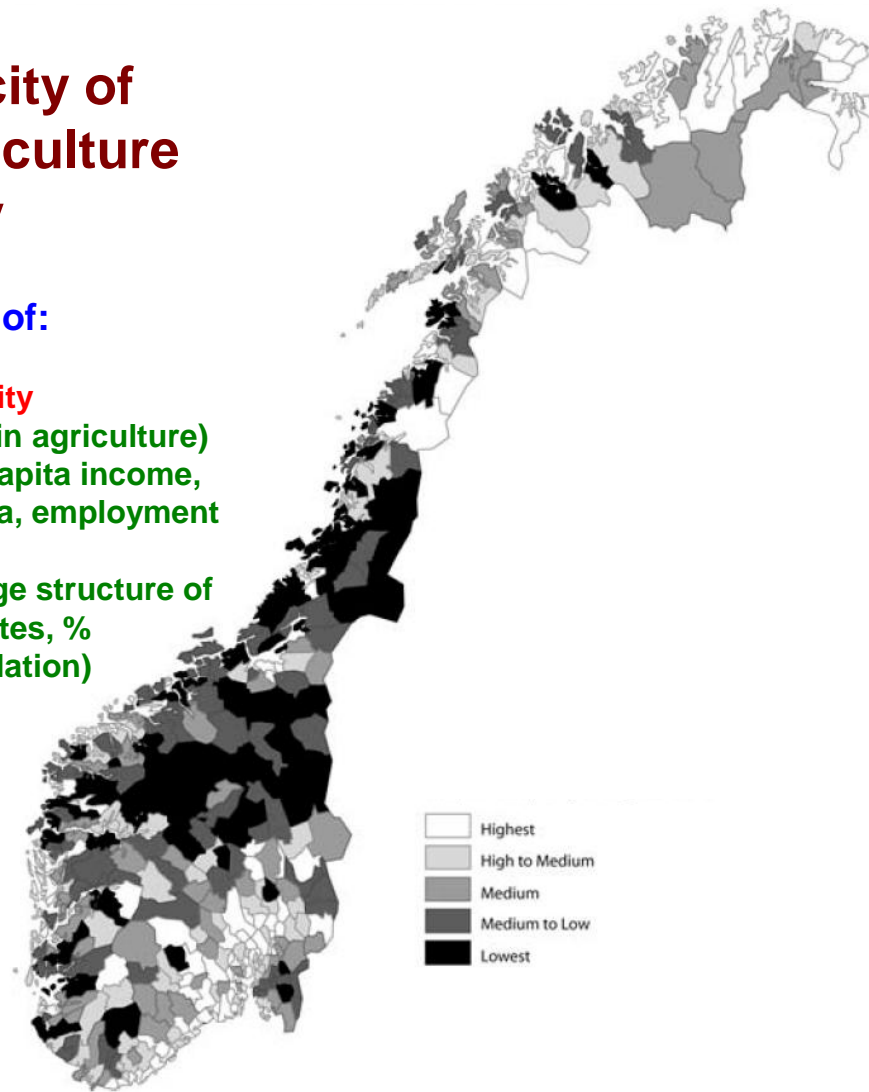


O'Brien et al. 2006

Adaptive capacity of Norwegian agriculture by municipality

Defined as a function of:

- **socioeconomic sensitivity** (% population involved in agriculture)
- **economic factors** (per capita income, state transfers per capita, employment prognoses)
- **demographic factors** (age structure of work force, migration rates, % dependents in the population)



O'Brien et al. 2006

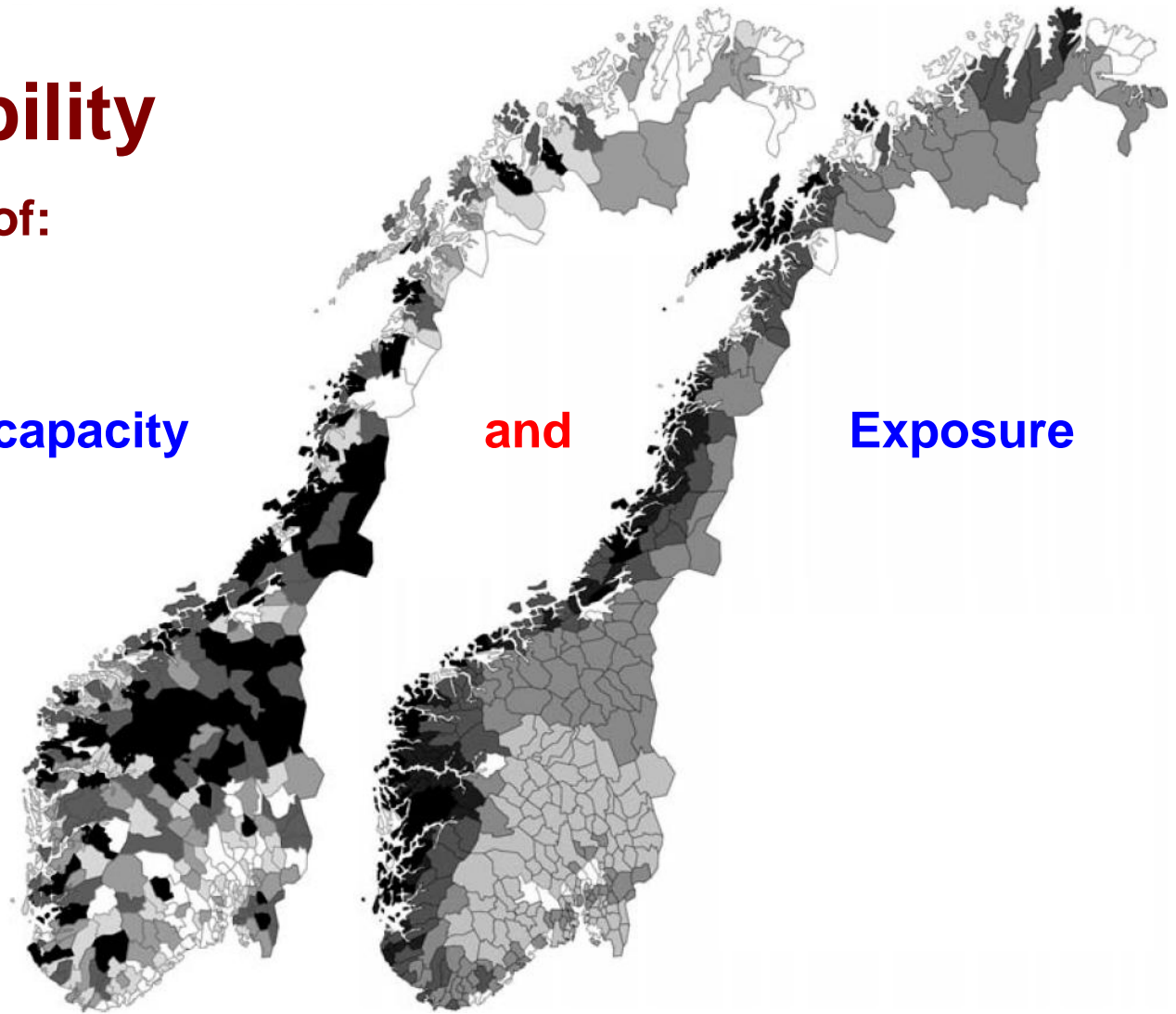
Vulnerability

is a function of:

Adaptive capacity

and

Exposure



O'Brien et al. 2006

Five objectives of CARAVAN

- Describe **exposure** to climate and climate change
- Evaluate sectoral **sensitivity** to climate change impacts
- Analyse **adaptive capacity** for coping with climate change
- Undertake **vulnerability mapping** for the present-day and mid-century
- Liaise with **stakeholder groups**

Thematic focus

Outcomes of CARAVAN Kick-Off Meeting, 25-26 November 2008, SYKE, Helsinki

■ Agricultural vulnerability

- Vulnerability questionable economically, but important role for maintaining rural vitality
- Useful exercise for pilot study, building on earlier Norwegian study



■ Study of the elderly

- Explore possible factors determining vulnerability, e.g. isolation, infirmity, susceptibility to bone breaks, intrinsic resistance to adapting lifestyles
- Investigate data needs: demographic data (defining and locating the elderly), institutional infrastructure of care; economic information



Analytical challenges

■ **Compilation of baseline data**

- Variables (e.g. climate, socio-economic, technological, land use, other environmental)
- Municipality scale (interpolation, modelling, regional harmonisation)
- Reference period

■ **Scenario development**

- Time horizon (2021-2050)

■ **Indicator selection and combination**

- Description
- Transparency
- Weighting

■ **Spatial analysis**

- Common and harmonised regional mapping system
- Web-based interface

■ **Vulnerability assessment**

- Relevance of indicators for application
- User participation
- Effective communication and accessibility

Advances on earlier studies

- **Trans-national (NO, SE, FI)**
- **Considers future as well as present-day adaptive capacity**
- **Examines composite vulnerability indices**
- **User interface for stakeholder participation (planned)**
- **Increased transparency of indicators**
- **Flexible options for indicator selection and manipulation**

Role of this Workshop

- Engage regional stakeholders responsible for decision-making in climate-sensitive sectors
- Present method and preliminary results
- Solicit feedback on the relevance and potential usefulness of the research
- Encourage suggestions for new indicators or alternative methods
- Discuss the added value of a pan-Nordic approach

16.45-18.15 Theme 3: Mapping vulnerability to a changing climate in the Nordic region

Mapping vulnerability to climate change in the Nordic region: Introduction to the CARAVAN project (Tim Carter, FI)

A Nordic-wide GIS analysis of adaptive capacity for agriculture (Aino Inkinen, FI)

Characterizing vulnerability of the elderly to climate change in the Nordic region (Karen O'Brien, NO and Hanna Mela , FI)

Illustrating regional exposure to changing climate: towards an interactive tool for mapping vulnerability (Stefan Fronzek, FI)

CARAVAN: Vulnerability mapping – does it make sense? (Louise Simonsson, SE)

Interacting with maps and information: towards a new approach to adaptation (Virginia Antonijevic and Mauricio Munera, NO)

The screenshot shows a Mozilla Firefox browser window with the URL [www.environment.fi - Climate change: a regional assessment of vulnerability and adaptive capacity for the Nordic countries](http://www.environment.fi/syke/caravan). The page content includes:

- Navigation: Site map | Suomeksi | På svenska
- Header: www.environment.fi Finnish Environment Institute (SYKE)
- Search: Search Advanced search
- Menu: Ministry of the Environment | Regional Environment Centres | Permit Authorities | Finnish Environment Institute | www.ara.fi
- Breadcrumbs: << Previous level
- Project Info: 3/27/2009 (Updated) Finnish Environment Institute. Contact the person in charge.
- VERSIONS: Printable version
- RELATED LINKS: Project partners (Research Programme for Global Change, University of Oslo, University of Linköping), Related projects (Finland, Norway).
- Text: Welcome to the home page of CARAVAN. CARAVAN is a research project that runs from June 2008 to December 2010, with the full title: "Climate change: a regional assessment of vulnerability and adaptive capacity for the Nordic countries".
- Footer: Documents and data. CARAVAN internal website

That's it

Thank you for listening

- ▶ First CARAVAN stakeholder meeting to be held in Sweden, 3-4 September 2009 (by invitation - more later).
- ▶ The CARAVAN kick-off meeting took place at the Finnish Environment Institute on 25-26 November 2008. More information is available on the internal website or by contacting the Project Leader.

Documents and data

[CARAVAN internal website](#)