

Caravan

Mapping vulnerability to climate change in the Nordic region

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Vulnerability to climate change

Vulnerability is defined as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change. Previous research indicates that even in relatively wealthy countries, with well-developed social welfare systems, there can be substantial differences in the ability to adapt to climate change between social groups, regions and sectors.

Measuring vulnerability

Measures of vulnerability (V) typically include three components:

- E**xposure to climate change ,
- S**ensitivity to its effects and
- A**daptive capacity for coping with the effects , such that:

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

Exposure relates to the magnitude and rate of change in climatic variables such as temperature, rainfall, wind, snow or humidity that are known to cause impacts on natural systems and society. There has been an intensive research effort in recent decades to model climate responses to greenhouse gas emissions in the Nordic region.



Sensitivity is the degree to which a system (e.g. water resources, crop production, forest growth, human health) is affected by climate variability or change. Research into climate change impacts in the Nordic region has also received considerable attention in recent decades.



Adaptive capacity is a measure of society's resources and capabilities to offset the adverse effects of climate change or exploit possible benefits. The processes of adaptation can involve complex social, economic and cultural adjustments, but research is only beginning to examine these processes and devise methods of measuring them.



What is CARAVAN?

CARAVAN (Climate change: a regional assessment of vulnerability and adaptive capacity for the Nordic countries) is a two-year collaborative project (2008-2010) that aims to explore alternative approaches for estimating and mapping vulnerability to climate change at the municipal scale across the Nordic region. It focuses on vulnerability in two thematic areas: agriculture and the elderly.



Vulnerability of Nordic agriculture

Agriculture contributes a relatively minor share to the economy of the Nordic region but nevertheless plays an important role in maintaining rural population, providing local employment and preserving cultural landscapes. A previous study for Norway combined a number of indicators into composite indices of exposure and adaptive capacity for agriculture, which were then mapped by municipality. As a preliminary exercise, the CARAVAN project has repeated the Norwegian analysis, updating the indicators, collecting comparable data for Finland and Sweden and mapping composite indices across the whole Nordic region. Some early results are shown in Figure 1.

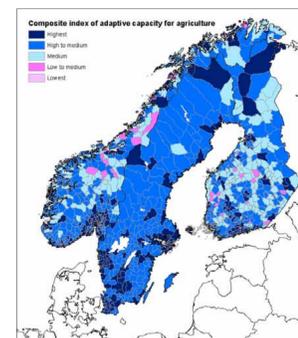


Figure 1. Composite index of adaptive capacity in agriculture based on four normalised indicators for 2007-2008: sectoral employment, proportion of workforce aged 55 or more, in-migration rate and dependency ratio. The four indicators have relative weightings of 3:1:1:1, respectively. Estimates are preliminary. Source: National Statistical Offices.



Climate change and the elderly

The cohort of the Nordic population aged 67 and older is growing rapidly (Figure 2), meaning that there are more older people who are living longer. This can be considered an emerging vulnerability to climate change in Nordic countries that will require new adaptation strategies. As illustrated tragically during the Paris heatwave of 2003, the elderly can be especially vulnerable to certain weather events such as high temperatures, icing of pavements, or storm-related damage that cuts off access to essential services and social networks. Some of these events are expected to become more frequent under a changing climate. Risk factors that are common across the Nordic region include living alone, chronic or severe illness, dependency on medications and social exclusion. The CARAVAN project is compiling a set of indices of extreme weather conditions alongside demographic and socio-economic statistics in order to develop vulnerability measures.

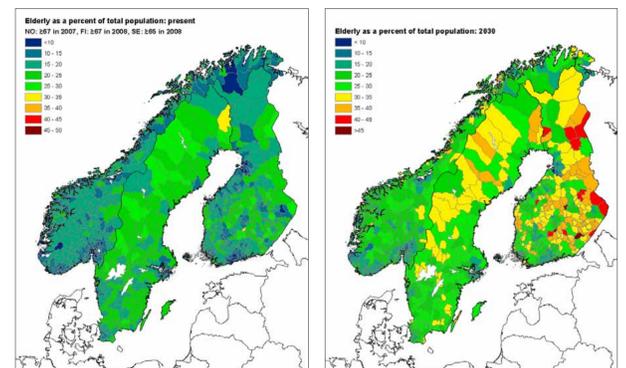


Figure 2. Elderly population (≥67 years in Norway and Finland; ≥ 65 in Sweden) as a percentage of the total, by municipality: present day (left) and projected for 2030 (right). Note that projections for Swedish municipalities are scaled according to projected national average changes. Source: National Statistical Offices.

Next steps: towards an interactive mapping tool

The next steps of the analysis involve:

- 1 Consulting regional stakeholders on the selection of common indicators considered to be relevant across the Nordic region.
- 2 Collecting data or running models to compute indicators of present-day vulnerability, by municipality.
- 3 Obtaining or deriving projections of indicator values for a future period centred on 2040.
- 4 Developing an interactive web tool for displaying present-day and future indicators, weighting them (as desired), combining selected indicators into user-defined vulnerability indices and mapping these for municipalities across the Nordic region.