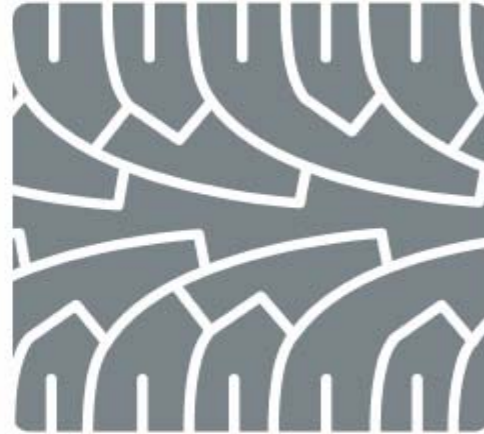


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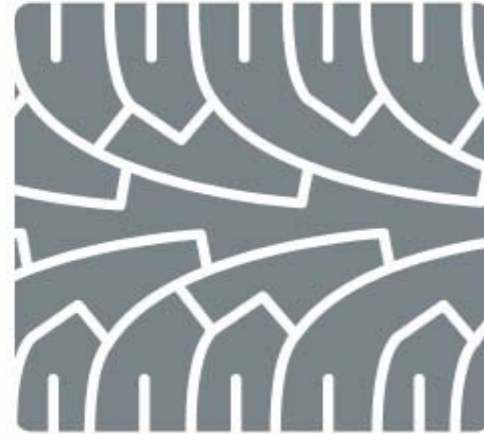
R&D program evaluating the effect of climate change on the road network and remedial actions

Norwegian Public Roads Administration

2007- 2010, cca 2,5 mill €



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Main objective: Improve design, construction and maintenance of the road network in order to accommodate climate changes.

i.e.

Evaluate and recommend measures necessary for maintaining both safety and accessibility in a changed climate.



Continues work carried out in NPRA since 2004 and aimed at adjustments to climate change.

Cooperation partners:

Norwegian State Railway

Norwegian Geological Survey

Norwegian Geotechnical Institute

Norwegian Meteorological Institute

Norwegian Water Resources and Energy directorate

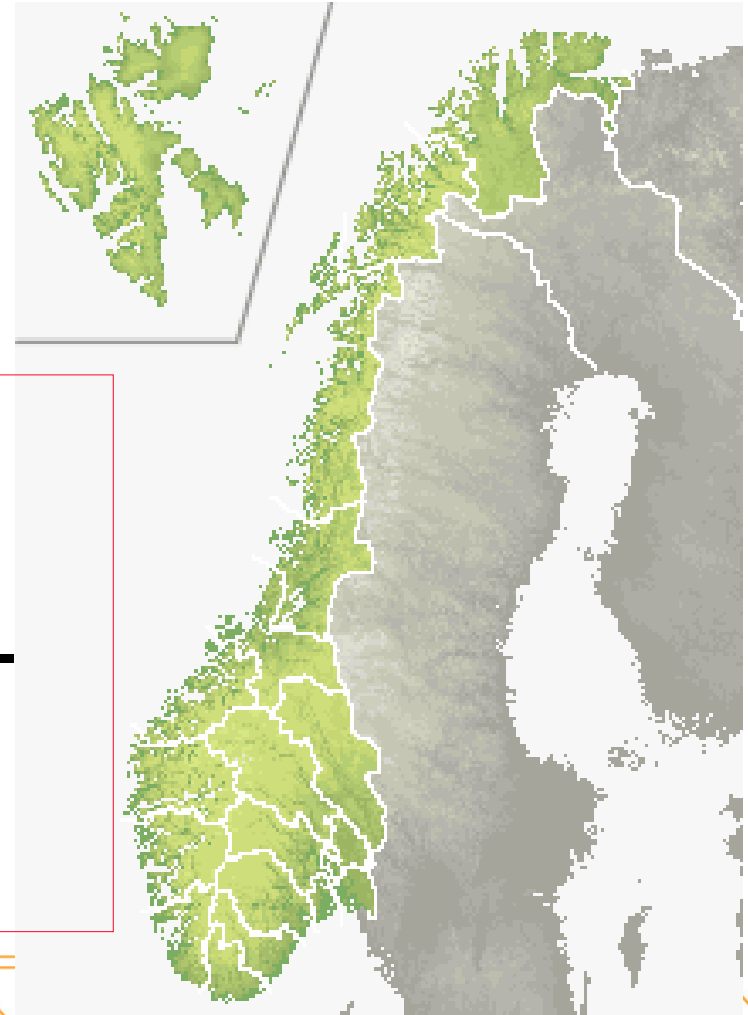
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Background

The road network is influenced by climate conditions

- **Increased precipitation – frequency and intensity**
- **Milder winters**
- **Warm and dry summers in the south-eastern areas**
- **Increased wind speeds and storm frequencies**



Effect on roads

- Higher ground water levels, **increased danger from floods** and erosion;
- **Change in flood and slide pattern**: higher frequency of slush avalanches, debris slide and mud flow. Also – other locations of slides;
- **Potentially incorrect premises** for choice of structural solutions and dimensioning of physical protection;
- **Potentially insufficient safety level** of existing slide protection
- More exposure to **freezing and thawing** in some areas;
- **Reduced accessibility and regularity** of roads and railways, need for alternative routes
- Need for improved **emergency plans**



Effect on roads – Limiting the project

The project focuses on **consequences**, not on the source of problems

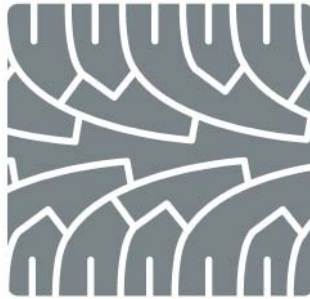
Climate change is a change in design premisses.

Remedial action - with relation to the **planned level of maintenance** (not real maintenance)

However...

emergency systems must be designed according to the real level of maintenance.





Project tasks

- 1. Literature survey – define the starting point**
- 2. Data: collection, processing and storage**
- 3. Flood and erosion prevention**
- 4. Avalanches: snow-, soil-, flood slides, rock fall**
- 5. Bearing capacity of roads**
- 6. Consequences for winter operation**
- 7. Emergency plans and susceptibility**





Challenges:

- * Climate change relates to almost any activity in NPRA >> **coordination** with ongoing work is important!
- * **Strategic issues** are also important - What will road authorities choose?
- * Enormous interest for the topic requires **dynamic dissemination of results**



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