Investigation into the authorities’ efforts to limit flood and landslide hazards

Presentation at the seminar on Auditing climate change, Copenhagen
24.03.2010
• 324 000 km² + Arctic islands
• 4.8 millions inhabitants, mostly living in the South
• Mountainous with glacial erosion
• Wet climate along the coast, dryer inland, with long winters
• Many (mostly short) rivers
Flood
Flood and landslide

- **Quick clay** is clay that was deposited on the seabed (so-called marine clay), but which is now found on land because the land has risen since the last ice age. The salt from the sea binds the clay, but may be washed out over time, leaving the clay unstable.

- Example of the quick clay slide in Rissa in Central Norway in 1978:
Flood and landslide – Quick clay
Mountain-slides
Flood and landslide – Background

- Many areas are at risk
- The risks may increase with climate change
- The parliament has emphasised the necessity of measures against flood
- Many ministries are concerned, but especially two: The Ministry of Petroleum and Energy and the Ministry for the Environment
- The municipalities authorize building. They also need help from the State (i.e. mapping and advice).
The goal has been to assess the extent to which the Ministry of Petroleum and Energy and the Ministry of Environment and their subordinate agencies adhere to the decisions and intentions of the Parliament and national objectives for the prevention of flood and landslide hazards.
Flood and landslide – Objectives 2

Two main lines of inquiry:

• What mapping of flood and landslide hazards has been carried out, and how is it disseminated and used by the municipalities?

• How do the authorities ensure that national objectives in the field of floods and landslides are adequately followed up?
Flood and landslide – Audit criteria

- The Planning and Building Act
- The Water Resources Act
- The Natural Damage Act
- Propositions to the parliament
- Reports to the parliament

(The EU Floods Directive of 23.10.2007 has not yet been adopted by Norway).
Flood and landslide – Methods 1

- Map analysis using GIS (geographical information systems) which are computer-based systems for the recording, modelling, adaptation, analysis and presentation of geographical data.

- GIS was mainly used for obtaining an indication of how many buildings and inhabitants there are in the mapped hazard areas.
Areas mapped for potential rockfalls and snow avalanches

Areas mapped for quickclay-areas

Rivers mapped for potential flooding
Quickclay

GAB

Quickclay

Flood

Rockslide and avalanches
GAB
Grunneiendom, Adresse, Bygg
Realestate, Address, Buildings

"national register and information system containing data on all real estate in Norway"
Map of areas exposed to flooding

200 year flood

500 year flood
Map of area exposed to avalanche and rockfalls
Map of Quickclay areas

Unstable ground
Flood and landslide – Methods 2

- Analysis of documents from the parliament
- Questionnaire surveys sent to all the municipalities and county governors in order to establish how the municipalities handled their responsibility for the prevention of flood and landslide hazards
- Meetings with the ministries, NVE, municipalities and one county governor
Flood and landslide – Questionnaire 1

- Are the municipalities aware of their responsibility for protecting inhabitants against flood and landslides?
- Do the municipalities have the competence and capacity in relation to flood and landslides?
- Do the municipalities receive adequate help from the State?
Flood and landslide – Questionnaire 2

• Is the mapping adequate?
• Is there a need for more mapping?
• Are the municipalities and county governors aware of available mapping?
• Do the different mappings take climate change into consideration?
• Do the municipalities and the county governors know how to consider climate change in relation to flood and landslide hazards?
Flood and landslide – Lessons learned

- GIS was a very efficient method for quantifying the number of buildings and inhabitants in the areas at risk.
- Trends (less building activity after the mapping?): More difficult to use GIS (periods might be too short, building activity depends of many factors).
- Only 62% of the municipalities answered to the questionnaire.
- Right timing for the investigation?
Flood and landslide - Results

• The investigation will be presented to the parliament 15 April 2010.
• Before that, all I can say is that although the ministries do a lot of things, there is room for improvements.