

Flood risk management in a cold climate – experience in Norway

**LINMEI NIE¹, LARS A. ROALD², SOFIE MELLEGÅRD¹
& ČEDO MAKSIMOVIĆ³**

*1 SINTEF Building and Infrastructure, Forskningsveien 3B, PO Box 124 Blindern, 0314 Oslo, Norway
linmei.nie@sintef.no*

2 Norwegian Water Resources and Energy Directorate, PO Box 5091, Majorstua, 0301 Oslo, Norway

3 Imperial College London, South Kensington Campus, London SW7 2AZ, UK

Abstract Studies of historical large floods in Norway show that the major triggering factors of floods are rainfall and combinations of rainfall with snowmelt, avalanche or ice run. Because of its geographical location, different regions in Norway have a cold or mild climate, or both; precipitation may come alternatively as rainfall or snowfall. Most rivers have two or more flood seasons. Spring floods are the results of snowmelt, often in combination with rainfall; while autumn floods are due to intense rainfalls or storms. Because of the variation of precipitation with temperature and snowmelt water, impacts of climate change on floods are extremely sensitive in cold climates. Comparing the existing common flood risk management approach with the specific problems in the cold climate, and taking into account the emerging risk due to the dynamic changes in climate and in society and requirements for adaptation, this paper presents a comprehensive approach for flood risk management. Case studies in large river basins and urban catchments are presented to demonstrate the difference of changes and consequences in rural areas and urban catchments. Moreover, the need for new approaches, special models and tools to handle the problems and requirements for data with appropriate resolutions are addressed.

Key words climate change; cold climate; flood risk management; snowmelt; adaptation