

Norway (Jordskredvarslingen)

Years of operation: 2013 - today
 Area covered: 324 000 km²
 Managed by: NVE (MET, NPRA)

Summary: Threshold exceedances are calculated up to 9 days in the future, with a spatial discretization of 1 km², based on relative water supply into the soil (from rain and snowmelt) and relative soil saturation from hydrological modelling combined with susceptibility map. Forecasters assess different grid data maps to issue daily warning for counties or group of municipalities.

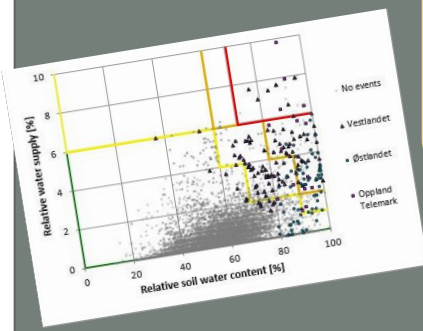
Types of landslides
 Rainfall- and snowmelt-induced landslides (shallow slides, debris flows, debris avalanches), slushflows

Monitoring
 Meteorological (400) and hydrological stations* (water discharge: 350, groundwater level: 80, soil moisture: 10)

Forecast
 24h and 3h meteorological and hydrological forecast (e.g. rain and snowmelt, groundwater and snow conditions, soil frost depth, soil saturation) received 5-6 times per day

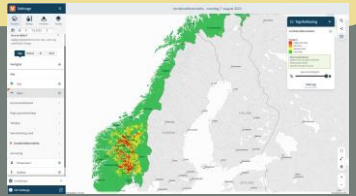
Other input features
 Landslide susceptibility maps at catchment level

Types of assessment
 Hydrometeorological threshold



Spatial discretization
 1 km² raster data

Formulation
 National hydrometeorological threshold based on forecast of snowmelt and rain vs relative soil saturation, calculated based on statistical analyses (decision tree), combined with the susceptibility map at catchment level through a combination matrix.



Human consultation before issuing a warning?
 Yes

Warning zones
 Variable (group of municipalities or counties, minimum one municipality)

Warning levels
 Four: low (green), moderate (yellow), high (orange), very high (red)

Warning time
 Current day and next 2 days (7 am to 7 am)

Information type
 - bulletin (twice a day)
 - website
 - subscription to notifications (e-mail, text message)
 - CAP Common Alert Protocol

NVE: Norwegian Water Resources and Energy Directorate
 MET: Meteorological Institute
 NPRA: Norwegian Public Roads Administration

Periodic evaluations to identify strengths and problems and improve the system:
 * observation data used for evaluation of model forecast data
 ** data from ca. 12,000 landslides in soil available for future threshold analysis and performance evaluation

Landslide data**: (for thresholds analysis) 206 landslides