



Regional mapping and frequency-magnitude analysis in the evaluation of landslide warnings in Hordaland, Norway

Kamilla S. Sandboe (1), Graziella Devoli (2), and Karianne S. Lilleøren (1)

(1) Department of Geosciences, University of Oslo, Oslo, Norway (kamillss@student.geo.uio.no; k.s.lilleoren@geo.uio.no),

(2) Norwegian Water Resources and Energy Directorate, Oslo, Norway (gde@nve.no)

With its large topographic differences and location at the west coast of Norway, Hordaland county is susceptible to weather-induced landslides such as debris flows and debris avalanches. The temporal and spatial occurrence of these landslides are predicted by the landslide warning system established by the Norwegian Water Resources and Energy Directorate (NVE).

The warnings are disseminated to the public as text messages and in form of four color-coded levels. Each level describes the number of landslides that are expected from a meteorological event within an area with a 10.000-15.000 km² extension. However, the warnings do not include expected landslide size, except a general assumption as “large landslides that disturb infrastructure and roads may occur” for the orange level 3. The observations, however, show that the same warning level might cause several smaller slides instead, causing widespread damage.

Although the Norwegian landslide database (NLDB) is quite extensive and with a large number of historical and recent landslides recorded the information of landslide magnitude is lacking. This is a consequence of a lack of systematic mapping of landslides in Norway.

This study aims to prepare event-inventory maps for rain- and snowmelt episodes, that have triggered landslides in the Hordaland county in the period 2011-2017 by controlling the quality of landslides registered in the database, mapping their extension and by performing frequency-magnitude (FM) analyses, resulting in FM-curves. A list of weather events that caused landslides was prepared. All landslides caused by these weather events were then mapped with polygons in ArcMap. The mapping was conducted using different sources of information like aerial photos, lidar imagery, photos and written descriptions. FM curves were prepared for the different event-inventories. Future works include the analyses of the warning levels sent out in the period investigated and the evaluation of the performance of the warning system. This work is part of a master thesis at the University of Oslo and done in collaboration with NVE. It has the final goal to provide better quality landslide data, by a systematic mapping of landslide magnitude and frequency, to be used in the definition of landslide thresholds and to improve the performance of the forecasting and warning service. As weather-induced landslides are expected to increase in the future, an improvement of the database is imperative to improve the performance of the warning system.