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A framework to update 10-year-old landslide susceptibility predictions - assessing the accuracy of existing landslide susceptibility models

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Since 2014, a landslide susceptibility model is used by the Geological Survey and Spatial Planning Unit from the Regional Council of Lower Austria to guide decision-making and strategic development in the approx. 19,200 km² province. This existing map (1:25000) has been compiled by using a multi-temporal inventory composed of 12889 slides. In order to obtain the landslide susceptibility model, a generalized additive model (GAM) has been applied, using a large range of predictors. Predictions were performed on the basis of sixteen lithological units. To spatially communicate the landslide propensity, predictions are divided into three categories: low, medium, and high, based on quantiles. By design, the low landslide susceptibility covers 78% of the territory while containing 5% of the landslides. The medium susceptibility class covers 16% of the territory, including 25% of the landslides. The high susceptibility class covers 6% of the territory while containing 70% of the landslides.

Although apparently able to correctly predict landslide occurrences over these nearly ten years, this map was never quantitatively evaluated. Since late 2021, a following up review project aims to evaluate how well the existing landslide susceptibility model from 2014 was able to correctly predict the landslides occurring after its implementation. This evaluation is based on landslides that occurred after 2014. Subsequently, the landslide susceptibility will be recalculated, and potential differences between the landslide susceptibility models investigated. To assure fair comparison, an identical methodological design is applied. Changes in the spatial prediction are quantified and explored.

Preliminary analysis suggests that the adequacy of the 2014 map to predict future landslides is good but highly determined by the inventories characteristics (i.e., quality and mapping method). For instance, 61% of the landslides coming from a high-quality inventory occur over highly susceptible zones. For a low-quality inventory, this percentage is observed to be rather lower

(36%). However, it is also determined that, even for the landslides not occurring in the highly susceptible zone, their locations are rather close to predicted highly unstable zones. For instance, more than 80% of any landslide observations are at least 40m away from a predicted highly unstable zone. The preliminary remodeling of the landslide susceptibility (by including these new landslides) suggests for the regional scale that 88% of the territory remains with the same predicted landslide susceptibility class. However, the arrangement for the individual lithological units might substantially differ. Strategies on how to perform a comparison and updating of landslide susceptibility models are discussed.