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Future storylines of landslide susceptibility in the Styrian Basin, Austria. Accounting for environmental change and uncertainties

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With changing environmental conditions, the risk of landslides will also change. For the Styrian basin, Austria, we investigate how storylines of climate and land use/land cover change may affect future landslide susceptibility (2071-2100). Our analysis is based on two extreme rainfall events in Styria in 2009 and 2014, which triggered more than three thousand landslides causing a major threat to the local population and significant damage to settlements and infrastructure.

Furthermore, while the number of studies analysing the impact of climate and land use change on landslide dynamics is rising, the assessment of their uncertainties is still often neglected. However, the quantification of uncertainties is not only essential for the development of business strategies and policy interventions, but also for increasing transparency and confidence in scientific analysis. Therefore, we additionally analyse the joint contribution of climate change uncertainty and landslide model uncertainty for the developed storylines of landslide susceptibility.

We found for the worst-case storyline (4 K warming scenario) a substantial increase in highly susceptible areas due to much heavier rain. However, the estimated prediction uncertainties were generally high in all storylines. We discovered that the parametric landslide model uncertainty was of the same order as the climate scenario uncertainty, while uncertainties due to internal climate model variability were negligible. With an improved availability of event-based landslide inventories and high-resolution ground data, uncertainties in storylines of landslide susceptibility may be reduced.