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Potential impacts of climate change on hazard zoning and implications for risk analysis and decision-making

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The assessment of dangerous processes and the delimitation of hazard zones is a fundamental task in risk analysis and risk management. Because of the high relevance of the hazard zone maps as programming documents, the Department of Hydraulic Engineering made two case studies to analyse the sensitivity of the methods and procedures for the delimitation of flood and debris flow hazard zone maps against climate changes. The consequences of the expected changes of environmental parameters that are considered in the hazard assessment were analysed by means of simulation models. The case study of the Mareiter Bach river showed an increase of discharge due to the assumed future increase in rainfall intensity. The modelling results showed a remarkably increase of the flooded areas and an increase in flow depths. Generally, the "yellow" zones delineated on the basis of the actual climate conditions tended to become "blue" zones under future climate conditions. This will lead to significant restrictions for land use. The method for the delimitation of the "red" zones tended to be robust. The number of affected buildings in "blue" zones increased from 7 to 35 considering the future climate conditions. The study demonstrated that already known weak points in risk reduction systems in future will become more important in risk management activities. The case study of the Tschenglser Bach torrent showed that the volume transported by debris flows increased remarkably due to the increase in discharge and transport capacity when considering possible future precipitation intensities. The case study showed that possible effects of climate changes are not relevant for torrents that have been systemized with remarkably efforts and where the runout and deposition areas of the torrential processes have been kept free from settlements

and infrastructures. But due to the high relevance of protection systems, the sediment management in alpine torrents will meet future challenges. In future, the costs for maintenance of existing protection structures will increase due to higher deposition volumes and due to a higher frequency of removal of debris flow deposits from sediment retention basins. Thus, cost-benefit analyses made within the planning of new protection structures must consider the higher operating expenses. The uncertainties due to possible effects of climate change should be considered risk management.