Mitigating torrential risks in mountanous regions through forest management: A case study from Slovenia

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ABSTRACT

Slovenia, as part of the Alpine region, is characterized by a complex hydrological network of torrential streams influenced by lithological and geomorphological characteristics, and precipitation patterns. The majority of torrential streams are located in forests. Forest ecosystems play a crucial role in mitigating the impacts of torrential hazard. Despite Slovenia's long-established close-to-nature, sustainable and multifunctional forest management system, measures to mitigate torrential hazards along mountain streams have often been neglected. This is partially a consequence of manifold competences of different actors, and an absence of comprehensive torrent management system. The increased frequency and intensity of extreme weather events over the past decade have caused severe forest damages and substantial fi-

nancial losses due to torrential floods, which has triggered many debates and activities dealing with torrent management in forests. In the presentation, we will introduce an approach developed within Forest EcoValue project aimed at establishing a comprehensive management system for torrential risk mitigation in forests. The study area used represents a diverse mountainous region (proportion of forests 74%). Our methodology follows a systematic framework, beginning with the identification of high-risk torrents based on hazard maps, field assessments, and historical damage records. There are 72 torrents with a total length of 102 km within the study area. 33% of these torrents are considered problematic, while 5% are classified as highly problematic. We developed a monitoring system incorporating the documentation of silent witnesses, the identification of critical areas for woody debris removal, and the delineation of torrent sections requiring targeted biotechnical interventions. Additionally, we recorded the time spent on monitoring the assessment of efficiency and estimate the needed capacities. At the end, we proposed a governance model (i.e., responsibilities of different actors). To elaborate the system, several activities were caried out on staff training, capacity building, networking between stakeholders using a set of participatory workshops. Our results will highlight the role of sound forest management in the comprehensive system of torrential risk mitigation, particularly in the context of climate change and enhanced flood protection. The study was funded by the Forest EcoValue project (Interreg Alpine Space Programme).