

EMERGENCY MANAGEMENT TOOLS FOR FLOODS AND DEBRIS FLOW EVENTS IN SMALLER CATCHMENTS

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INTRODUCTION

Floods and debris flows frequently cause fatalities and significant economic loss in Switzerland. Through organizational measures to mitigate the harm (such as mobile flood protection, evacuation, and preventive closures), the impacts of these negative events can be substantially reduced. In order to best employ best measures in emergency cases, site-specific information on precipitation, discharge, and other relevant conditions is needed. Furthermore, relief units require support tools which enable quick and efficient decision making regarding the use of intervention measures. They need to know where, how, and when they have to act; e.g., to make optimal use of mobile levees.

In the paper, we report on recent advances in the Swiss warning and intervention strategy for flood management. We focus on two tools developed over the last three years. The first, called IFKIS-Hydro, is an information and warning system for hydrological hazards in small and medium-scale catchments. Its development was based on experience gained in avalanche warning and it is now being tested in the cantons (i.e. Swiss districts) of Glares and Valais. The second tool is an intervention plan that provides relief unit officers and safety managers with the information needed to plan and organize activities and to give priority to particularly vulnerable sites. In the following sections we describe both tools. We conclude by explaining the role of warning and intervention tools as important pillars of emergency management and outline the further development.

IFKIS-HYDRO

In 2004, the development of an information and early warning system for hydrological dangers in smaller catchments (1-1000 km²) was started. The system more or less duplicated the positive aspects of the avalanche warning system (IFKIS), and was therefore named IFKIS-Hydro. IFKIS-Hydro combines different types of information such as the general level of hazard, weather forecasts, precipitation measurements, discharge simulations, and local observations of event-specific phenomena. The collected information is presented on a web-based platform called InfoManager. This platform gives the latest data on current and future flood and debris flow situations in real time. IFKIS-Hydro also provides a database which enhances understanding of the behaviour of observed streams and rivers and supports decision-making for future events.

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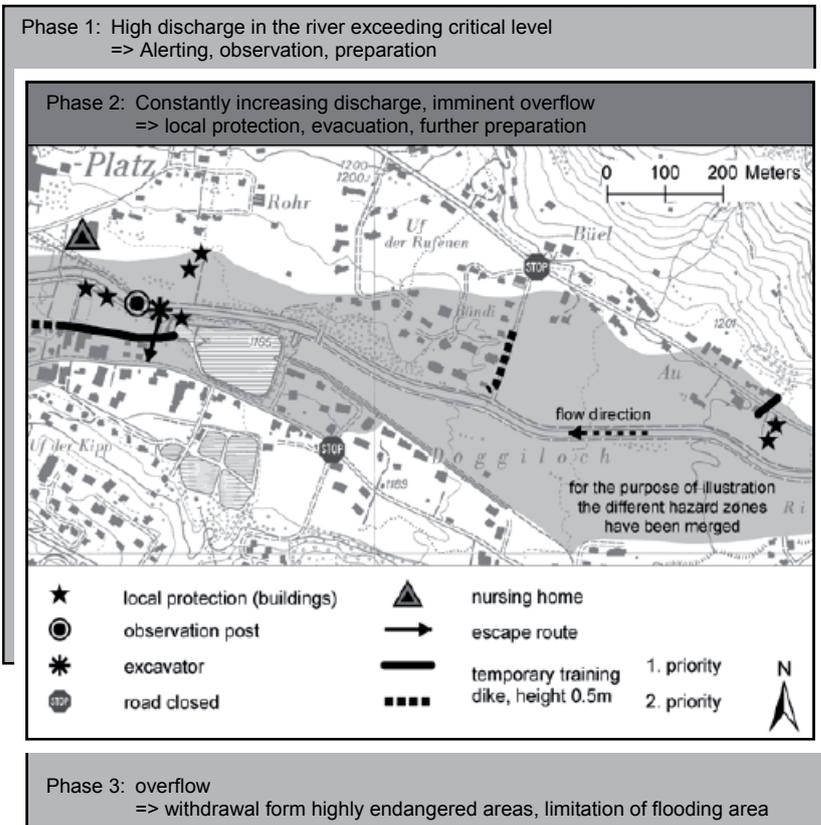
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INTERVENTION PLAN

The intervention plan supports good decision-making during an event. It was developed mainly to aid fire brigades, which act in the front lines in an emergency event. The plan is based on a flood hazard map, providing thorough information on the hazard situation. It shows times and locations for possible temporary mitigation measures. The plan helps to save time because the intervention can be prepared and practiced before a real emergency situation



occurs, and the needed materials such as mobile flood protection tools can be acquired in advance. In addition the intervention plan distinguishes different event phases, suggesting possible further development of the event (Fig. 1). The time-saving effect should also be supported by an early warning system like IFKIS-Hydro. Last but not least, an encapsulated form of the plan, printed on both sides of a sheet of A4 paper for each object and each event phase, facilitates a quick and accurate transfer of information.

Figure 1: Example of a multi-phase intervention plan (Landquart River, Klosters, Switzerland)

EMERGENCY MANAGEMENT

Warning and intervention are important pillars of successful emergency management. The decision-support tools described above should substantially contribute to more effective emergency management. They are particularly useful for interventions in small-scale catchments which respond rapidly to heavy precipitation, in which cases safety officers previously had to rely on vague and inaccurate information such as local weather forecasts and get by with little information on process initiation and development. There is keen interest among those involved in Switzerland to further advance these and related tools as well as to employ and to institutionalise them in regions prone to floods and debris flows. In addition, the WSL initiates and supports research initiatives that help to improve the understanding of the underlying processes and eventually enable more accurate hazard warning systems.

Keywords: emergency management, early warning system, intervention, hazard map