INFORMATION SYSTEM FOR HYDROGEOLOGICAL RISKS (IHR)

A STANDARDIZED PROCEDURE FOR THE COMPILATION OF HAZARD ZONE AND RISK MAPS REGARDING FLOODS AND DEBRIS FLOWS IN THE AUTONOMOUS PROVINCE OF BOLZANO SOUTH TYROL, ITALY

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INTRODUCTION

Hitherto, in the Autonomous Province of Bolzano - South Tyrol no standardized procedure for the identification and analysis of flood and debris flow processes have been prescribed by law. Dealing with natural hazards was based on hydrogeological expertises for single basins of torrents. The extent of potential damages due to hazardous natural processes has not been taken into account. In the last years, the responsible regional authorities set up guidelines for the compilation of hazard zone maps. These hazard zone maps are to be a stringent basis for local land use planning. Within ten years, for all 118 communities hazard zone maps have to be prepared.

METHODS

Due to the stringent time span, limited financial resources and due to the lack of a wide-spread experience with or profound knowledge about hazard mapping and risk analyses on the part of experts, local and regional authorities, the Department for Hydraulic Engineering decided to develop a standardized procedure for the compilation of hazard zone maps for flood and debris flow processes.

As a first step, all needed information about floods and debris flows for the preparatory works are compiled in a database. An information system has been developed for the identification and localization of the settlement areas and infrastructures endangered by floods and debris flows. For the identification and delimitation of potential debris flow and overbank sedimentation processes, a combination of different GIS-based process models developed by geo7 was used. The triggering areas were delineated from the digital elevation model and other GIS-databases. The run out areas of the dangerous processes were calculated by the use of combined empirical and physical models. As a basis for the identification and delimitation of flood processes a procedure for the determination of potential weak points for overflow and potential dam break failures has been developed. Starting from these localized weak points, a simplified 2D-simulation describing the worst case–scenario was made for the delimitation of potential endangered areas. As a second step, a collection of more than 2000 historical flood and debris flow events during the last 1000 years was compiled. Subsequently, the modeled process areas were verified with the historical events. As a third step, the delimitated process

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areas and their associated watersheds and triggering areas were intersected with the categorized damage potential. With this step, a map of areas with different detail levels for the compilation of the hazard zone was created.
All compiled datasets were made accessible in different ways for differentiated target audiences. The complete dataset was published by means of a database application accessible for internal users throughout the intranet. Light-weighted datasets were published by means of an internet map server accessible for all users throughout the internet. For the local authorities, a strategic manual with all information needed for the commitment and support of the experts as well as for the implementation of the hazard zone map in the local land use plan was composed. For the committed experts, most of the needed information could be extracted from the information system.

RESULTS

The principal outcomes of this procedure were the knowledge about the potential process areas and those areas where the compilation of a hazard zone map on a high detail level or where risks reduction measures are needed. Within a few months needed for the elaboration of the hazard index maps, an overview of the risks due to floods and debris flows could be given for the whole region (7000 square kilometers).

CONCLUSIONS

With the separation of areas where the hazard zone map has to be elaborated in a high detail level from those areas where the hazard zone map could be compiled in a regional detail level, the total amount of areas for the compilation of detailed hazard zone maps could be reduced significantly. Thus, time and costs could be saved. The prioritization of the endangered areas leads to a useful basis for decision-making at the regional level. The standardized compilation of all regional data about potential and evident (historical) processes in one information system and the publication of these datasets in the internet support the strategy of a transparent knowledge-management. The regional authorities now are able to support the local authorities in an efficient way, providing them with the information needed for the tender procedure and to support the commissioned experts. The standardized procedure defines a helpful path line for all stakeholders and concerned persons and a formalized model for the compilation of data on local scale during the elaboration of hazard zone maps by the experts. Thus, the strategy for coping with natural hazards and risk becomes more transparent and efficient than before.

Keywords: Flood, Debris Flow, Risk-Prevention, Information System