A METHODOLOGY FOR HAZARD ZONE EVALUATION TAKING INTO ACCOUNT SOLID MATTER TRANSPORT

… PART OF THE ADAPTALP PROJECT IN COOPERATION WITH FEDERAL WATER ENGINEERING ADMINISTRATION, CARINTHIA, AUSTRIA

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INTRODUCTION

According to the EU Floods Directive 2007/60/EC member states are required to provide and coordinate among each other comprehensive information as well as evaluation tools to enable integral catchment area management. Thereto the provision of extensive information regarding relevant hazard-processes and the involved risk of pre-defined scenarios is requisite. Solids such as sediment bedload and dead wood play an important role in the classification of hazard zones along valley-rivers - such as those within the task area of the Bundeswasserbauverwaltung Kärnten (Federal Water Engineering Administration, Carinthia) -, but have so far been insufficiently taken into consideration in federal guidelines for hazard zoning (2006).

OBJECTIVES

It is the target of the project AdaptALP (Adaptation to Climate Change in the Alpine Space) to develop close-to-applications and flexible evaluation-methodology, which allow for the development of realistic solid matter transportation scenarios in valley-rivers under consideration of their torrent-like feeders. The main attention thereby is focused on (i) existing and generally accessible data, (ii) pre-defined and therefore comprehensible scenarios, and (iii) consistent quality of the used data, analyses and in selection of the applied evaluation methods. The employed methodology is based on the theoretical model presented by Mazzorana & Fuchs (2009).

METHODOLOGY

When evaluating design floods, the effect of feeders to the overall system has to be viewed as spatially scale-variable. Hence no statistic relation between design-values of different subareas of investigation exists, and neither the consequential events nor the overall system-behavior can be demonstrated comprehensively. Therefore another approach is chosen to represent the system´s performance: At identified weak-points capacity-overload of the system is induced through pre-defined realistic scenarios. The resulting critical configurations are subsequently reviewed and evaluated by experts, and are then taken into account, if deemed relevant.
Prior to specifying detailed computation processes, a systematic analysis of the band-width of system-behavior should be performed and comprehensively documented. In this initial step the stream-system is divided into homogeneously performing sections, similar to the classification in the system AGS, Hübl et al. (2007). Only active processes are taken into account such as mobilization, transport and deposition of sediment-bedload and driftwood. Based on the transfer processes assigned to the individual sections, the channel system is represented by process sequence charts. At the connecting nodes between the sections additional process-input or – output and alternatively process-changes (increase or decrease) take place. These nodes can represent points of confluence, branching or transfer as well as weak points. The consequential effect of flood-sequences for underlying sections and nodes in regard to increase or decrease (filtering) is implemented at those nodes.

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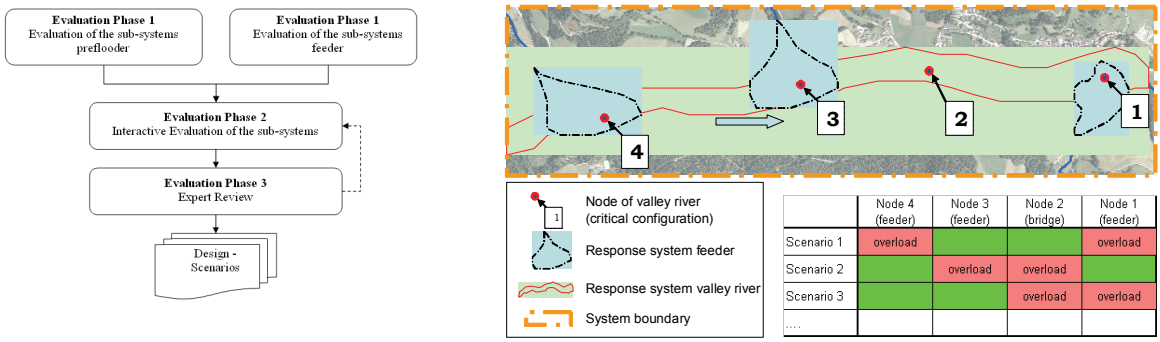

Fig. 1 Scheme for the Scenario-Analysis (left) and sheme of case study area (right).

IMPLEMENTATION

The evaluation is carried out in a three-step approach given in Fig 1, left side. While the preflooder and the feeders are being evaluated separately in the first step (evaluation-phase 1), interaction between the two is taken into consideration in the second step (evaluation-phase 2). In form of a "basis-scenario" the consequence of flood events is assessed corresponding to the existing hydrologic profile. Additionally individual scenarios account for the consequence from maximum flood-events on one or several feeders. In a third step all scenarios are being evaluated and weighted comprehensively by experts (evaluation-phase 3) which select design-scenarios as final outcome.
The course of a scenario is presented in form of a process-sequence-chart, consistent of stream-sections, inlet-points (nodes) as well as weak points. The ultimate result is presented as a scenario-matrix for the relevant sections and nodes, which is based on the initial process-sequence-chart. Following the "expert-decision-making-process" regarding relevant scenarios, those can be integrated into appropriate simulation methods for the analysis of flood-levels and hazard zones.

RESULTS

A case study conducted in the area of a feeder to the upper part of the river Drau (in Carinthia, Austria) demonstrated that deposition-processes in the lower reaches of the feeder had important influence on solid matter transfer which was adequately illustrated by scenario-modelling.
A second case study demonstrates the applicability of the developed methodology of scenario-analysis in case of the interaction of several feeders and a valley river within the residential development area of the municipality Metnitz (political district St. Veit/Glan in Carinthia, Austria). This area was selected, since several feeders with weak as well as strong sediment transport potential show impact on a closely populated area. Fig 1 - right side shows the river and its feeder subsystems with identified weak points 1 to 4 for different scenarios their critical configuration (overload) is given in the matrix below which corresponds to evaluation phase 3. Based on this matrix relevant design scenarios are selected by expert's choice.

REFERENCES

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Keywords: scenario analysis, solids, hazard zones, river engineering, Metnitz