

Rossitsa River Basin: Flood Hazard and Risk Identification

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The process of Flood Risk Management Planning and adaptation of measures for flood risk reduction as the Early Warning provoke the necessity of surveys involving Identification aspects.

This project presents risk identification combining two lines of analysis: (1) Creation a mathematical model of rainfall-runoff processes in a watershed based on limited number of observed input and output variables; (2) Procedures for determination of critical thresholds - discharges/water levels corresponding to certain consequences. The pilot region is Rossitsa river basin, Sevlievo, Bulgaria.

The first line of analysis follows next steps: (a) Creation and calibration of Unit Hydrograph Models based on limited number of observed data for discharge and precipitation; The survey at the selected region has 22 observations for excess rainfall and discharge. (b) The relations of UHM coefficients from the input parameters have been determined statistically, excluding the ANN model of the run-off coefficient as a function of 3 parameters (amount of precipitation two days before, soil condition, intensity of the rainfall) where a feedforward neural network is used. (c) Additional simulations with UHM aiming at generation of synthetic data for rainfall-runoff events, which extend the range of observed data; (d) Training, validation and testing a generalized regional ANN Model for discharge forecasting with 4 input parameters, where the training data set consists of synthetic data, validation and testing data sets consists of observations.

A function between consequences and discharges has been reached in the second line of analysis concerning critical hazard levels determination. Unsteady simulations with the hydraulic model using three typical hydrographs for determination of the existing time for reaction from one to upper critical threshold are made. Correction of the critical thresholds aiming at providing necessary time for reaction between the thresholds and probability analysis of the finally determined critical thresholds are made.

The result of the described method is a Catalogue for off-line flood hazard and risk identification. It can be used as interactive computer system, based on simulations of the ANN "Catalogue". Flood risk identification of the future rainfall event is made in a multi-dimensional space for each kind of soil conditions (dry, average wet and wet condition) and observed amount of precipitation two days before. Rainfall-runoff scenarios in case of intensive rainfall or sustained rainfall (more than 6 hours) are taken into account. Critical thresholds and hazard zones needed of specific operative activities (rescue and recovery) corresponded to each of the regulated flood protection levels (unite, municipality, regional or national) are presented.

The Catalogue gives the opportunity for flood hazard scenarios extraction. Regarding that, the Catalogue is useful on the prevention stage of flood protection planning (emergency operations, measures and resources for their implementation planning) and creation of scenarios for training the Emergency Plans.

Concerning application for Early Warning, it gives approximate forecast for flood hazard. The Catalogue supplies the necessary time for reaction of about 24 hours. Thus, Early Warning is possible to the responsible authorities, all parts if the Unified Rescue System, members of suitable Headquarters for disaster protection (on municipality, region or national level).