AOGS 2005

Simulating scenario floods for hazard assessment on the lower Bicol floodplain, the Philippines

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Bicol river floodplain and cause substantial suffering, loss of life and economic damage, especially for the city of Naga. The Bicol floodplain is located on the island Luzon of the Philippines. Simulating flood events that may occur in this region using a computer model can contribute to minimizing the loss of life and damages to property and it is essential for supporting flood risk management.

This research applies a 1D2D flood propagation model in the Lower Bicol Floodplain to simulate flood events for return period of 2, 5, 10, 25 and 50 years. This 1D2D flood model, SOBEK, requires three input parameters: a Digital Elevation Model, surface roughness coefficients of the floodplain and input hydrological data. The DEM was generated from interpolation of spot heights and contour lines obtained from different sources and scales. The hydrological data consisted of discharge and water level hydrographs for the return periods of 5, 10, and 25 years. Values for return period of 2 and 50 years are derived from statistical interpolation and extrapolation of the available data.

The modeling resulted in spatial distribution of flood extent, water depths, velocity, and time of flooding. The model results showed an increase in the inundation extent of about 50 % from flood with a return period of 2 years to the largest flood with a return period of 50 years. Positive correlation between the inundation depth, flow velocity and the probability of flood events was found, where the higher return period, the higher the depth of inundation and the flow velocities. The model results were compared with the 2003 results of a study by Nippon Koei for the Bicol River Basin and Watershed Management Program. For water level calibration, scatter plots of the model results and the reference model showed good agreement with 0.98 correlation coefficient for return period of 5 and 25 years and 0.99 for return period of 10 years. Indicator maps produced from modeling were further processed to create flood hazard maps. Understanding that the level of flood hazard can not be measured by single parameter, this research proposed hazard maps based on single and multiple categorizations. It was found that different parameters, either single or multiple, created different flood hazard maps that are suitable for multiple users with different information requirements.