Multireservoir operations for flood management in Tanshui River basin, Taiwan

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This study assesses the effectiveness of the reservoir system under different design flood events based on SOBEK-RIVER modeling package. The balanced water level index is introduced to deal with the optimal approach for joint reservoir operations. The simulation results suggest that SOBEK-RIVER significantly facilitates the model establishment for studying the propagation of floods through different flood events. It is also found in this study that the joint operation policy performs better during flood emergencies by minimizing flood damage for downstream area.

The approach is applied to the Tanshui River which is located in the north of Taiwan and consists of three major tributaries: Tahan River, Hsintien River and Keelung River. Two reservoirs (Shihmen and Festui) are located in the upstream (Tahan and Hsintien) for regulating water release to protect downstream areas from floods during typhoon strikes.

To simulate the flood process, the river mouth is selected as the downstream boundary while the inflow into the river basin is controlled by the precipitation. The frequency-duration relationships derived from recorded intense bursts of rainfall of various durations are used to design the precipitation hydrographs. The storm tide distribution in the river mouth is analyzed with Monte Carlo simulations of the tide and storm surge distribution at river mouth to determine the occurrence probabilities of the extreme storm tides. All the scenario designs are based on the available data from typhoon Nari of the year 2001.

The study models the flood behavior by the SOBEK-RIVER modeling system which was developed by DELTARES. The proposed procedure in this study involves three modules which are a rainfall runoff model, a reservoir operation model and a channel routing model respectively.