Optimal storm selection for hydraulic design of mixed urban and agricultural drainage systems in the Northern Delta-Vietnam

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The recent October 2008 urban flooding of Hanoi, with 450 mm falling in two days (the highest recorded in the past 35 years), 17 casualties and about 150 M€ of material losses draw the attention to the need of an updated estimation of design storms for the heavily populated area of the Northern Delta, in Vietnam. This paper presents a design storm selection procedure for the hydraulic design of drainage systems in mixed urban areas and lowland rice agricultural crops. The procedure is based on the comparison of the design storm and continuous simulation method with a semi-distributed conceptual rainfall-runoff model. The 'optimal' design storm hyetograph is selected such that the resulting hydrograph statistics better reproduce those obtained from the continuous simulation. By analysing a 24 years record of 10 minutes rainfall data in the rainfall season from the Hanoi station, updated Depth-Duration-Frequency curves were derived for the Red River Delta region, testing different probability distribution and parameter estimation methods. Typical storm profiles for short duration-high intensity and long duration-high volume events were identified and a set of suitable design storms was selected. To better simulate statistics of stormflow peaks and volumes in the components of the drainage system, i.e. culverts in the urban drainage, channels and ponds in the agricultural crops, different combinations of high intensity and high volume storms were identified as 'optimal'.