



## **A comparison of different hydrologic modeling approaches: the case study of Cerfone river**

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The increasing occurrence of extreme meteorological events and the strong land exploitation, especially the overbuilding and urbanization of the flood prone areas, has led to a considerable increase of the hydraulic risk associated to these areas and, consequently, to an effort of institutions and researchers to find proper solutions.

The analyzed case study deals with the Cerfone river, a tributary of the Tiber River, in the Tuscany region (Italy). The complex morphology of the floodplains and the presence of hydraulic structures (i.e. bridges) that block the river discharge cross section, cause the periodic flooding of the neighbouring small villages during extreme weather events.

The flood hazard management and safety plan implementation is strictly connected to the hydrological modeling of river basin. The uncertainty in rain-run off evaluation can lead to different results in terms of discharge peak and hydrographs shape, affecting then all the next risk analysis. The choice of the hydrologic model to apply in the study of Hydraulic Risk delineation is therefore a critical issue.

In this work three different approaches to model the basin hydrological response are used and discussed:

i) lumped model built in accordance with the standards of methodological model of ALTo (ALLuvioni Toscana, Tuscany Region), generally used in the region for hydrologic and hydraulic studies; ii) a semi-distributed model, performed using the hydrological software model HEC - HMS (Hydrologic Engineering Center, US Army Corps of Engineers), which is based on the evaluation of the value of critical duration storm at significant sections of the basin. It is based on models for estimated losses, inflows - outflows transformation method and meteorological model in accordance with the standards of ALTo; iii) lumped model based on the rational equation and the concentration time of Giandotti, in accordance with the methodology of the Tiber River Basin Authority.

The critical analysis and the subsequent comparison of the results obtained using the aforementioned models, allowed the choice of appropriate solutions, in order to optimize both the levels of security assured for population and the activities and the economic costs for flood control measures (structural and non-structural).