



## **Flood-risk mapping: numerical analysis on the effects of a lateral weir**

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This study evaluates the flood-risk changing associated to the building of a lateral weir in a large area by means of a bi-dimensional (2D) hydraulic simulation for generating flood-risk maps. The analysis was performed over a 270 km<sup>2</sup> flat area close to the left levee of the Reno River, Ferrara (Northern Central Italy). We chose this particular area for several reasons: (1) there are a lot of industrial activities in here; (2) around 25000 habitants living there; (3) in the last century, this area was interested by two relevant flood events, a first event in the 1949 (inundated area equal to 60 km<sup>2</sup>) and a second one in the 1951 (inundated area equal to 116 km<sup>2</sup>). The aim of this study is to evaluate how a lateral weir, built in 1960 in the Reno left levee, modified the flood-risk of the flat area here considerate. The analysis was performed by making two different flood-risk maps of the study area: a first one considering the natural geometry of the Reno's levee and a second one considering the presence of the lateral weir. Each flood-risk map was generated by using the numerical results of an inundation model. In particular, we used a finite element 2D model, that was calibrated on the historical flood events, for simulating several inundation scenarios. Each scenario considers different characteristics of the levee breach (localisation, time of formation, width and depth of the breach) and corresponds to a different probability of occurrence. The results of each scenario, in terms of water depth, water flow velocity and residence time, were then elaborated in order to generate the flood-risk map.