



## **Flood risk assessment of fresh water supply systems**

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Flooding is a common hazard causing damages to people, buildings and infrastructures. Often located in low-lying areas or nearby rivers, water utilities are particularly vulnerable to flooding. Water and debris can inundate the facility, thereby damaging equipment and causing power outages. Such impacts can lead to costly repairs, disruptions of service, hazardous situations for personnel and public health advisories. While flood damage evaluation to buildings and their contents is becoming increasingly available, the quantification of impact on critical infrastructures is less common. In this work, we present the flood risk assessment of a fresh water supply system considering the hazard of a riverine flooding and exposure and vulnerability of the system components (i.e. pipes, junctions, lifting stations etc.). The evaluation of flood impact on the aqueduct network is carried out for flood scenarios with assigned recurrence intervals. Vulnerable elements exposed to the flood are identified and analysed in order to determine their residual functionality. Above a selected threshold, the affected elements are considered as failed. The water distribution piping system is modelled through a model based on EPANET designed so as to implement Pressure-Driven Demand (PDD), which is more appropriate when modelling water distribution networks with a high number of offline nodes. Results of piping system model affected by the flood are then compared in a QGIS environment with flood depth to identify the location of service outages and potential risk of contamination. The application to the water supply system of the city of Florence (Italy), serving approximately 385000 inhabitants through 900 km of piping is presented and discussed.