



On the development of damage-dysfunction matrices for the urban drainage network

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Modelling of flood damage to network infrastructures is essential for supporting policy makers and managing authorities in mitigation and restoration actions against inundations and, consequently, in improving the resilience of the related territory. This study analyses the potential impacts of floods on urban drainage systems by proposing a general methodology which can be adapted to other typologies of networks. The flood event that hit the city of Parma in October 2014 has been selected as a case study in support of the work. The method consists in the construction of damage-dysfunction matrices based on expert interviews, as proposed by Eleutério et al. (*Nat. Hazards Earth Syst. Sci.*, 13, 983–998, 2013), for Parma's drainage system. These matrices allow analysing both physical and functional vulnerability of each component of the network and identifying the interconnections and, therefore, the potential transfer of dysfunctions between the different components. Regarding this last point, a hierarchy method was developed in order to assign a functional vulnerability degree to each component, hence helping the managing authority to prioritize response actions in case of emergency. Nonetheless, by identifying the number and types of users connected to each sewage pipe, the potential adverse consequences of sewerage's disruptions for society can be investigated as well.