



## **Procedures for the redaction of flood risk maps based on the derivation of proper specific indexes for urban areas**

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The quick transformation processes that, in the last decades, characterized some urban areas, induced as a consequence the increase of catchment imperviousness level and, naturally, the increase of the outflows generated during rainfall. Notwithstanding, the hydrographical network is often insufficient to convey such discharges and it is gradually substituted by artificial drainage systems having the function to convey the runoff coming from urban areas towards the closest receiving water body. The estimate of the flooding risk in urban areas is made even more difficult if one considers that flooding generated only by zenithal waters are normally more frequent than floods occurring from natural water bodies and they may involve even small portions of the urban zones with respect to rain spatial variability. Hence, as for the littorals, also for the urban areas the reduction of the risks related to floods must be based on a preliminary identification of the areas under risk. The above described phenomena make the estimate of the flooding risk in such areas complex, since it must not only deal with problems related to the flood of the water bodies that cross or lick them, but also with flooding due to zenithal waters that fall on it. The problem becomes even more difficult considering the density and the various nature of elements at risk (persons, buildings, vehicles): the different mechanisms through which flooding can affect the elements at risk require the adoption of proper risk indicators focused on urban areas.

The presented research is aimed to tackle the analysis of the zenithal component of the urban floods, in such a way to obtain, along with the component related to the flood of water volumes from rivers that cross these areas, also a complete frame of the risk

conditions that threaten the anthropic structures. To the aims of the research, a hydrodynamic model describing the propagation of flood waves, based on the De Saint Venant equations in two dimensional form, in order to account for the topographic complexity of the area (preferential outflow paths, buildings, etc.), and for the characteristics of prevailing imperviousness typical of the urban areas has been used. The knowledge of the water depths distribution and of the flow velocities derived from the propagation model along with the knowledge of the anthropic characteristics of the areas allowed for the definition of properly risk indexes taking in account the hydrodynamic features of the events and the vulnerability of the various sensible elements (buildings, vehicles, ecc..).