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Drainage inlets efficiency and its impact on pluvial flooding hazard evaluation uncertainty

Anna Palla (1), Giuseppe T. Aronica (2), Ilaria Gnecco (1), Luca G. Lanza (1), and Angela Candela (3)

(1) Dept. of Civil, Chemical and Environmental Engineering, Univeristy of Genova, Genoa, Italy (anna.palla@unige.it; ilaria.gnecco@unige.it;luca.lanza@unige.it), (2) Dipartimento di Ingegneria Civile, Informatica, Edile, Ambientale e Matematica Applicata, University of Messina, Messina, Italy (garonica@unime.it), (3) Dipartimento di Ingegneria Civile, Ambientale, Aerospaziale e dei Materiali, University of Palermo, Palermo, Italy (angela.candela@unipa.it)

Flooding events in urban areas occur quite frequently as a consequence of rain events of lower intensity than the design one, even in case of correct network dimensioning. Inlets are in those cases the critical nodes, and efficient drainage is only ensured when care is taken on their appropriate design and positioning within the pluvial flood-prone areas. Classical approach for design and position of these hydraulic structures can result in high level of uncertainty in defining properly risk levels in urban areas. Further, evaluation of flood hazard in urban areas is made even more difficult if one considers that pluvial flooding can be caused by storm events characterised by a low return times and they may involve even small portions of the urban areas. This contribution is focused on the derivation of flood hazard maps in a probabilistic framework to overcome the classical problem of single deterministic prediction of flood extent for the design event and to introduce the concept of the likelihood of flooding at a given point as the sum of input data and parameterization uncertainty.
In particular, a stochastic generation of inlet efficiency scenarios with varying their position in pluvial flood-prone areas has been performed and rainfall forcing modelled using a bivariate approach based on copulas.
This methodological approach has been implemented in a selected study area in the town of Genoa. At this aim, in October-December 2009, a survey was carried out in order to investigate the operational conditions of the inlets throughout the study area. Based on the observed conditions the frequency distribution functions of inlet efficiency are determined according to the different sub-areas with specific anthropogenic characteristics.