Geophysical Research Abstracts
Vol. 13, EGU2011-1754, 2011
EGU General Assembly 2011

Use of call centre data for urban flood monitoring

Marie-claire ten Veldhuis
Netherlands (j.a.e.tenVeldhuis@tudelft.nl)

Urban flooding analysis is traditionally based on hydrodynamic model calculations. These models simulate the occurrence of flooding as a result of overloading of urban drainage systems by heavy rainfall. Comparison of model results with known cases of urban flooding shows that models are often unable to predict flood occurrences correctly (Rauch et al., 2002; ten Veldhuis et al., 2008). This is due to model inaccuracies, a lack of calibration data and because hydrodynamic models are unable to capture all processes that lead to urban flooding. Particularly flooding caused by blockages of sewer pipes and sewer inlets is not taken into account or is incorporated in a rudimentary way by assuming a fixed expected blockage probability. Monitoring data for flooding analysis and model calibration are difficult to obtain from sensor-based monitoring due the unpredictability of flood locations, especially in relation to blockage processes.

Meanwhile, many cities and water authorities are equipped with call centres that register call information on urban drainage problems observed and reported by citizens. These calls cover a variety of details on causes and consequences of observed problems, such as details on in-house flooding and maintenance-related problems like pipe blockages. Registered call information is used in the handling process, to direct the call to the proper operational units and to monitoring maximum handling time. Call information is not used by operators for analysis and improvement of urban drainage or other water infrastructure.

We present an application of call centre data in a quantitative analysis of urban flooding. Call centre data are used to identify flood locations, flooding frequencies and associated causes of flooding. Ten years of data from a call centre for a city of about 150000 inhabitants are used, comprising a dataset of 6444 calls. Call data consist of a unique call number, date of the call, street name where a problem has occurred and a telegram style text that describes what the caller has said. In most cases a second text is added that describes the results of on-site checking and actions undertaken to solve the call.

To prepare the data for quantitative risk analysis, call data are classified according two sets of classes: classes describing observed consequences of flooding and classes referring to observed causes of flooding. Calls are then assigned to independent rain events; independent rain events are defined by a separation of 24 or more hours of dry weather.

Application of the data in a quantitative fault tree analysis shows that gully pot blockages stand out as the main cause of urban flooding; the contribution of heavy rainfall to the overall probability of flooding is small compared to that of blockages. This implies that hydrodynamic model analyses, by focusing on overloading by heavy rainfall, provide an incomplete picture of urban flooding. Call data directly convey citizens' experiences regarding malfunctioning of water systems irrespective of the type of underlying physical process. Therefore call data provide a valuable source of information to complement data obtained from sensor equipment.

References

Rauch, W., Bertrand-Krajewski, J.-L.,Krebs, P., Mark, O., Schilling, W., Schütze, M., Vanrolleghem, P.A. (2002). Deterministic modelling of integrated urban drainage systems. Wat. Sci. & Tech., 45(3), 81-94.

Veldhuis ten, J.A.E., Clemens, F.H.L.R., Gelder van, P.H.A.J.M. (2008). Fault tree analysis for urban flooding. Wat. Sci. & Tech., 59(8), 1621-1929.