Assessing the efficiency of different CSO positions based on network graph characteristics

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ABSTRACT

The technical design of urban drainage systems comprises two major aspects: first, the spatial layout of the sewer system and second, the pipe-sizing process. Usually, engineers determine the spatial layout of the sewer network manually, taking into account physical features and future planning scenarios. Before the pipe-sizing process starts, it is important to determine locations of possible weirs and combined sewer overflows (CSOs) based on e.g. distance to receiving water bodies or to a waste water treatment plant and available space for storage units. However, positions of CSOs are also determined by topological characteristics of the sewer networks. In order to better understand the impact of placement choices for CSOs and storage units in new systems, this work aims to determine case unspecific, general rules for that. Therefore, based on numerous, stochastically generated virtual sewer systems of different sizes it is investigated how choices for placement of CSOs and storage units have an impact on the pipe-sizing process (hence, also on investment costs) and on technical performance (CSO efficiency and flooding). To describe the impact of the topological positions of these elements in the sewer networks, graph characteristics are used. With an evaluation of 2,000 different combined sewer systems, it was found that as expected with an increasing number of CSOs at more topological positions in the network results in more construction costs and better performance regarding CSO efficiency. Anyhow, at a specific point, no significant difference (further increase) in construction costs can be identified.

KEYWORDS

CSO-positions, automated design, virtual case studies, VIBe