Predicting flow and quality variability in growing urban drainage

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The paucity of data in urban catchments is a constraint when it comes to planning waterwise urban development. In this talk I'll present recent research where we investigated how urban stormwater infrastructure grows in time and how to use the network structure to estimate the variability of flows and water quality. We find that cumulative drainage area, pipe lengths and other catchment characteristics scale in almost an identical manner as natural rivers. So we conclude that the stormwater network structure is an inevitable outcome and not one designed by the engineer. We also applied an analysis of drainage network structure (i.e. the pipe network) to predict the characteristics of discharge following rainfall events, the flow recession exponent. From this and rainfall data we were able to predict the variability of discharge and water quality at 10 minute temporal resolution. The model compared well with a 17 year Storm Water Management Model simulation that had been extensively calibrated to data. The ability of such a simple model to reproduce these behaviours suggests a means to make predictions to better manage ungauged urban stormwater systems.