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A method for adjusting design stormpeakedness to reduce biasin hydraulic simulations

Samer Muhandes, Barnaby Dobson, and Ana Mijic
Imperial College London, Civil and Environmental Engineering, London, United Kingdom of Great Britain – England, Scotland, Wales (sm9415@ic.ac.uk)

In the UK, decision-makers use hydraulic model outputs to inform funding, connection consent, adoption of new
drainage networks and planning application decisions. Current practice requires the application of design storms to
calculate sewer catchment performance metrics such as flood volume, discharge rate and flood count. With flooding
incidents occurring more frequently than their designs specify, hydraulic modelling outputs required by practice are
questionable. The main focus of this paper is the peakedness factor (ratio of maximum to average rainfall intensity)
of design storms, adjudging that this is a key contributor to model bias. Hydraulic models of two UK sewer
catchments were simulated under historical storms, design storms and design storms with modified peakedness to
test bias in modelling outputs and the effectiveness of peakedness modification in reducing bias. Sustainable
drainage systems (SuDS) were implemented at catchment scale and the betterment achieved in the modelling outputs
was tested. The proposed design storm modification reduced the bias that occurs when driving hydraulic models
using design storms in comparison with historical storms. It is concluded that SuDS benefits are underestimated when
using design rainfall because the synthetic rainfall shape prevents infiltration. Thus, SuDS interventions cannot
accurately be evaluated by design storms, modified or otherwise.