

# From observed impacts to rainfall thresholds: compound risks of urban pluvial flooding

## Authors

Shifteh Mobini<sup>1,2</sup>, Behnaz Pirzamanbein<sup>3</sup>, Yiheng Du<sup>4</sup>, Lars Nyberg<sup>5</sup>

<sup>1</sup> Division of Water Resources Engineering, Lund University, Box 118, 221 00, Lund, Sweden.  
[Shifteh.mobini@tvrl.lth.se](mailto:Shifteh.mobini@tvrl.lth.se)

<sup>2</sup>Trelleborg Municipality, Sweden.

<sup>3</sup>Dept. of Statistics, Lund. Sweden

<sup>4</sup> Hydrology Research Unit, Swedish Meteorological and Hydrological Institute (SMHI), Norrköping, Sweden

<sup>5</sup> Risk and environmental studies, Centre for Societal Risk Research, Centre of Natural Hazard and Disaster Risk Science, Karlstad, Sweden

## Abstract text

Urban pluvial flooding is an increasingly significant climate-related risk in Nordic cities, where short-duration rainfall extremes interact with aging drainage infrastructure and urban form. This study analyses 17 years (2006–2023) of property-level basement flooding reports from Trelleborg, a coastal municipality in southern Sweden, to identify empirical rainfall thresholds and infrastructural conditions associated with flood occurrence and recurrence. Using observational flood data combined with high-resolution rainfall records, we apply statistical tests and decision-tree models to examine interactions between rainfall intensity, sewer system configuration, and property type.

Results show that basement flooding is most strongly associated with 60-minute rainfall intensity rather than total rainfall volume. A critical threshold of approximately 21–23 mm h<sup>-1</sup> was consistently identified across analytical methods, with substantial flooding also occurring below the national 10-year design standard. Combined sewer systems exhibited disproportionately high flood recurrence, but repeated flooding was also observed in separated systems under moderate rainfall, indicating that infrastructure upgrades alone do not eliminate risk. Property type further conditioned recurrence, highlighting compound interactions between hydrometeorological drivers and built-environment characteristics.

The findings demonstrate how data-driven, threshold-based analysis of observed impacts can complement hydraulic modelling and support climate-resilient urban planning. The approach is transferable to other cities seeking empirically grounded benchmarks for climate adaptation and risk management.

### *Keywords*

Urban Pluvial flooding, Empirical rainfall thresholds, compound climate risk