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Exploring public databases to characterize urban flood risks in Amsterdam

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Cities worldwide are challenged by increasing urban flood risks. Precise and realistic measures are required to decide upon investment to reduce their impacts. Obvious flooding factors affecting flood risk include sewer systems performance and urban topography. However, currently implemented sewer and topographic models do not provide realistic predictions of local flooding occurrence during heavy rain events. Assessing other factors such as spatially distributed rainfall and socioeconomic characteristics may help to explain probability and impacts of urban flooding.
Several public databases were analyzed: complaints about flooding made by citizens, rainfall depths (15 min and 100 Ha spatio-temporal resolution), grids describing number of inhabitants, income, and housing price (1Ha and 25Ha resolution); and buildings age. Data analysis was done using Python and GIS programming, and included spatial indexing of data, cluster analysis, and multivariate regression on the complaints. Complaints were used as a proxy to characterize flooding impacts.
The cluster analysis, run for all the variables except the complaints, grouped part of the grid-cells of central Amsterdam into a highly differentiated group, covering 10% of the analyzed area, and accounting for 25% of registered complaints. The configuration of the analyzed variables in central Amsterdam coincides with a high complaint count. Remaining complaints were evenly dispersed along other groups. An adjusted R2 of 0.38 in the multivariate regression suggests that explaining power can improve if additional variables are considered. While rainfall intensity explained 4% of the incidence of complaints, population density and building age significantly explained around 20% each.
Data mining of public databases proved to be a valuable tool to identify factors explaining variability in occurrence of urban pluvial flooding, though additional variables must be considered to fully explain flood risk variability.