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Estimating losses potentially caused by pluvial floods

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In recent years, pluvial floods have caused tremendous losses in German cities. For example, the city of Münster (population: 310 000) was hit by an extreme rainfall event on 28th July 2014, which caused insured losses in the residential sector of more than EUR 70 million. Due to a lack of accurate, comparable and consistent hazard maps, damage data and loss models for pluvial flooding, only little is known about the losses that can potentially be caused by this flood type. Based on a number of case studies and a regionalisation approach, this study aims to quantify the potential loss caused by pluvial flooding on urban areas in North Rhine-Westphalia, the most populous federal state in Germany. At first, a loss model is derived from a unique property-level dataset containing property losses caused by recent pluvial floods in Germany, as well as a wide range of factors potentially influencing these losses. Second, this model is calibrated to the Münster-event of 2014 and then applied to other urban areas in North Rhine-Westphalia using local hazard maps of pluvial flooding. Further, regionalisation is achieved by means of a regression based on unit loss indicators and unit asset values. By combining the derived loss indicators with current land cover data and a future land use scenario, the total loss potential of residential buildings for all of North Rhine-Westphalia is estimated at 13 billion EUR with an increase of around 6% by 2030. Besides these estimations, the loss indicators, such as the average loss per square meter urban area of 3.50 EUR/m^2, can be used by city planners and developers as a starting point for prevention planning in respect to pluvial flooding.