What is the value of a multi-decadal regional database of compensation claims for flood damage modelling and risk management?

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Flood damage modelling is a key component of flood risk modelling, assessment and management. Reliable empirical data of flood damage are essential to support the development and validation of flood damage models. However, such datasets remain scarce and incomplete, particularly those combining a large spatial coverage (e.g., regional, national) over a long time period (e.g., several decades) with a detailed resolution (e.g., address-level data).

In this research, we analysed a database of 27,000 compensation claims submitted to a Belgian state agency (Disaster Fund). It covers 104 natural disasters of various types (incl. floods, storms, rockslides ...) which occurred in the Walloon region in Belgium between 1993 and 2019. The region extends over parts of the Meuse and of the Scheldt river basins. The registered amounts of damage at the building level were estimated by state-designated experts. They are classified in six categories. While roughly half of the registered disasters are pluvial flooding events, they account for less than a quarter of the total claimed damage. In contrast, riverine floods correspond to about one third of the registered events, but they lead to one half of the claimed damage.

A detailed analysis of the data was undertaken for a limited number of major riverine flood events (1993, 1995, 2002), which have caused a very large portion of the total damage. By geo-referencing the postal address of each individual building, it was possible to assign each claim to a specific river reach. This enabled pointing at the most flood prone river stretches in an objective way. Then, using cadastral data, each type and amount of damage could be attributed to a specific building.

To explore the value of the database for elaborating and validating damage models, the claimed damage data at the building level were related to estimates of hydraulic variables for the corresponding flood events. To do so, we used an existing database of results of 2D hydrodynamic modelling, covering 1,200+ km of river reaches and providing raster files at a spatial resolution ranging from 2 m to 5 m for computed flow depth and velocity in the floodplains. The attribution
of flow depth to individual buildings was performed either by averaging the computed flow depths around the building footprint or by considering the maximum value.

The correlation between claimed damage at the building level and attributed flow depth is relatively low, irrespective of the flow depth attribution method. This may result from the high uncertainty affecting each of these variables. It also hints at the necessity of using multivariable damage models which account for a broader range of explanatory variables than the sole flow depth (flow velocity, characteristics of building material and equipment, building age, etc.). This will be discussed in the presentation and further explored in the next steps of this research.

Data for this analysis were provided by the Belgian regional agency SPW-IAS in July 2020. Due to privacy reasons, data at the address-level may not be disseminated in the scientific community; but results of data processing may be shared at an aggregated level.