

## **Contribution of future urbanisation expansion to flood risk changes**

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The flood risk is expected to increase in the future due to climate change and urban development. Climate change modifies flood hazard and urban development influences exposure and vulnerability to floods. While the influence of climate change on flood risk has been studied widely, the impact of urban development also needs to be considered in a sustainable flood risk management approach.

The main goal of this study is the determination of the sensitivity of future flood risk to different urban development scenarios at a relatively short-time horizon in the River Meuse basin in Wallonia (Belgium). From the different scenarios, the expected impact of urban development on flood risk is assessed.

Three urban expansion scenarios are developed up to 2030 based on a coupled cellular automata (CA) and agent-based (AB) urban expansion model: (i) business-as-usual, (ii) restrictive and (iii) extreme expansion scenarios. The main factor controlling these scenarios is the future urban land demand. Each urban expansion scenario is developed by considering or not high and/or medium flood hazard zones as a constraint for urban development. To assess the model's performance, it is calibrated for the Meuse River valley (Belgium) to simulate urban expansion between 1990 and 2000. Calibration results are then assessed by comparing the 2000 simulated land-use map and the actual 2000 land-use map.

The flood damage estimation for each urban expansion scenario is determined for five flood discharges by overlaying the inundation map resulting from a hydraulic computation and the urban expansion map and by using damage curves and specific prices. The hydraulic model Wolf2D has been extensively validated by comparisons between observations and computational results during flood event. This study focuses only on mobile and immobile prices for urban lands, which are associated to the most severe damages caused by floods along the River Meuse.

These findings of this study offers tools to drive urban expansion based on numerous policies visions to mitigate future flood risk along the Meuse River. In particular, we assess the impacts on future flood risk of the prohibition of urban development in high and/or medium flood hazard zones.

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