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Modelling the effectiveness of small-scale detention areas in adapting to coastal flooding – the case of Flensburg city

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Modelling the effectiveness of small-scale detention areas in adapting to coastal flooding – the case of Flensburg city

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Coastal hazards, such as storm surges and inundation, will become more severe with climate-change induced sea-level rise. Heavily exposed, coastal urban areas are often rarely prepared to resist these hazards but adaptation to increasing coastal hazards remains a challenge. Depending on the regional context, various measures can be used to foster adaptation. One of these possible measures are detention areas, which store water temporarily in order to lower water levels in specific locations. They have been broadly used as means for stormwater management, as well as for reducing consequences of fluvial flooding. This study analyzes the effectiveness of detention areas to adapt to coastal flooding, in the case of the city of Flensburg, Northern Germany. Using the reduced complexity hydrodynamic model Lisflood-FP, three flood scenarios were simulated (with and without adaptation) to test the effectiveness of small-scale detention areas. The first one is the flood event of storm surge Axel (01/04/2017); the second is a 200-year flood event; and the third includes an expected sea-level rise of approximately 1 m by 2100, all based on the same hydrograph. We find that small-scale detention areas are limited in their effectiveness to reduce the inundation extent and the depth of the flooding. However, they are effective in conveying the water away from identified assets, such as buildings and as such they are effective in reducing flood damage costs to buildings and infrastructure.