Flood Risks in Urban Areas - Data Analysis, Communication and Mitigation

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SUMMARY

The increased frequency of heavy rainfall events lead to urban flooding which induces immense damage and thus results in substantial costs in the urban area and in some cases even bodily injuries. The underground sewage system cannot cope with extreme precipitation events. Enlargement and remediation of sewage systems and the construction of - generally underground - storm water retention basins alone cannot solve the problem efficiently. Consequently, urban drainage and urban planning authorities have a joint responsibility for recognizing surface run-off as a structurally-formative force and for optimizing the spatial organization of the city in the interplay between topography, surface and underground flow paths, and area utilization schemes adapted to the latter.

Nowadays, the relationship between water resources management and urban development bodies is still characterized by a low degree of understanding of the interrelationships between water infrastructure systems, urban spaces and receiving waters. Information is not always shared between the different stakeholders.

In different multi-step analytical procedures, it was examined whether there are risky areas in the municipality, highly vulnerable to being flooded, and if so where and to what extent.). The basis is ideally a municipality-wide flood risk assessment. These areas can be subsequently examined, simulated and assessed at greater depth by means of various local detailed topographical and hydrological analyses, e.g. also using an interlinked 1D-2D sewer system-surface model. The simulation shows what paths the rainwater takes during a rain event and the spatial spread of the water. By subsequently superimposing the existing area and building utilization and infrastructural facility plans on these vulnerable zones, the possible impact of floods, and consequently the damage and risk potential, can be

ascertained.

The overall goals are to develop new web-based information system, forms of collaboration and to establish integrated planning processes bearing the needs of “risk management” and “water-sensitive urban design” in mind. The paper presents a methodology that coordinates and substantiates the interlinking of data analysis, hydraulic modelling, flood risk mitigation and urban development to devise integrated concepts for stormwater management. These guidelines for action and a webGIS-based information system are being elaborated as part of the two research projects entitled SAMUWA (2014-2016; Hoppe et al., 2016) and KLAS II (2015-2017) in the cities of Wuppertal and Bremen.