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Conceptualization of a Critical Infrastructure Network – Model for Flood Risk Assessments

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In flood risk analysis it is a key principle to predetermine consequences of flooding to assets, people and infrastructures. Damages to critical infrastructures are not restricted to the flooded area. The effects of directly affected objects cascades to other infrastructures, which are not directly affected by a flood. Modelling critical infrastructure networks is one possible answer to the question ‘how to include indirect and direct impacts to critical infrastructures?’.

Critical infrastructures are connected in very complex networks. The modelling of those networks has been a basis for different purposes (Ouyang, 2014). Thus, it is a challenge to determine the right method to model a critical infrastructure network. For this example, a network-based and topology-based method will be applied (Pant et al., 2018). The basic model elements are points, connectors and polygons which are utilized to resemble the critical infrastructure network characteristics.

The objective of this model is to complement the state-of-the-art flood risk analysis with a quantitative analysis of critical infrastructure damages and disruptions for people and infrastructures. These results deliver an extended basis to differentiate the flood risk assessment and to derive measures for flood risk mitigation strategies. From a technical point of view, a critical infrastructure damage analysis will be integrated into the tool ProMaDeS (Bachmann, 2020), a free software for a risk-based evaluation of flood risk mitigation measures.

The data on critical infrastructure cascades and their potential linkages is scarce but necessary for an actionable modelling. The Circle method from Deltares delivers a method for a workshop that has proven to deliver applicable datasets for identifying and connecting infrastructures on basis of cascading effects (de Bruijn et al., 2019). The data gained from Circle workshops will be one compound for the critical infrastructure network model.

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