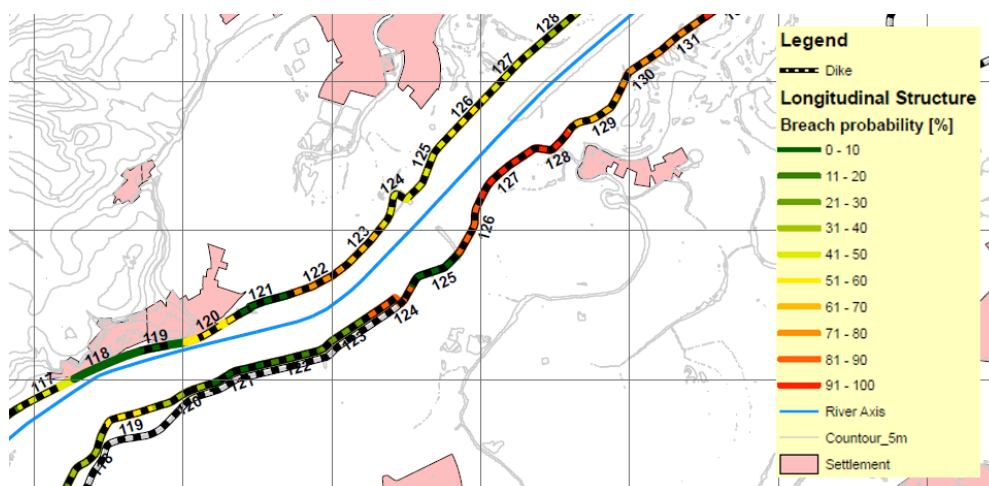


Master's Thesis – Civil Engineering
Implementation of flood hazard analysis under consideration of
levee failure – Case study of Danube River in Bavaria
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Background

For the evaluation of possible flood protection measures along the Danube River in Bavaria, cost-benefit analyses are to be compiled and evaluated. As a basis for a cost-benefit analysis, within this thesis a hazard analysis procedure is implemented in order to be able to assess the benefit of flood protection measures under consideration of levee failure. The implementation of the methodology is performed for the Bavarian section of the river downstream of the already constructed flood polder Riedensheim. Two scenarios were available for the application, namely reconstructed flood hydrographs for the events in 2005 and 2013.



Section of a simulated Dike Breach Hazard Map for reconstructed 2013 flood event at Danube River.

Methodology

Continuous flood defense lines must be determined for each side of the river, which provide significant protection for the hinterland. With the aid of a Monte Carlo analysis, longitudinal flood protection structures along the Danube River are tested for failure for a set of baseline events. The hazard assessment model represents a hybrid probabilistic-deterministic model. A failure is divided into two cases: dike breach or flood wave run-up. In the case of a simulated failure, the resulting water volume escaping in the hinterland is determined.

Conclusion

The simulated levee failure probability can be determined for each event and visualized in dike failure maps. The results showed great overestimation of the simulated dike breach probabilities, compared to the observed events. Also, the very simplified consideration of the flood discharge through a dike breach led to overestimation of the water volume escaping to the hinterland and thus the hazard. Limitations of the method are highlighted and recommendations for improvement of the methodology are given.