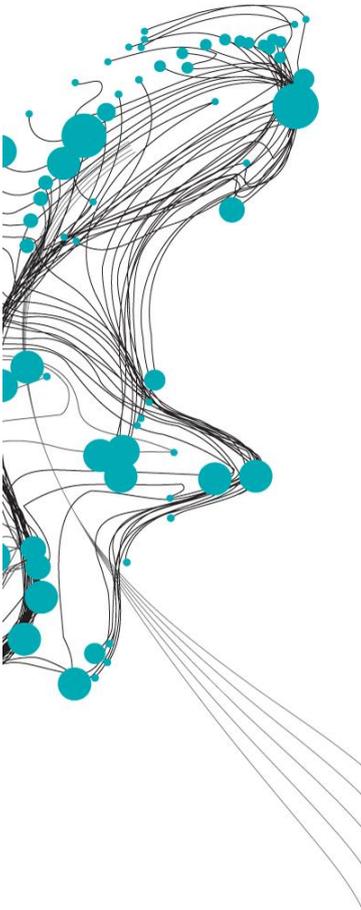


TWO-DIMENSIONAL MORPHOLOGICAL MODELLING OF THE EFFECTS OF THE ROOM FOR LIVING RIVERS VISION IN THE MIDDLE-WAAL



Ongoing bed degradation in the River Waal is leading to negative impacts on different river functions. This bed degradation can partly be contributed to river training works along the River Rhine which were aimed at sustaining or improving individual river functions over the past century. To mitigate these impacts, nature organizations in the Netherlands have come up with Room for Living Rivers (RfLR): a vision which balances ecology, flood protection and shipping interests considering the river and its functions as one system.

In this research, the ability of RfLR on mitigating the ongoing erosion in the Middle-Waal is investigated in 2DH using the DVR model. This morphological model, based on the Delft3D computational core, has previously been developed to model long-term, large scale morphological development of the riverbed of the Dutch Rhine branches. Using steady-state flow conditions based on a representative hydrograph, the bed development is assessed over a period of fifty years.

For the analysis, two different scenarios have been simulated to isolate the differences in bed development induced by a combination of side channels, large scale lowering of floodplains and removal of obstructions in the floodplains. These river training works are applied to the Middle-Waal, between Nijmegen and Tiel, while the effects have been studied along the complete reach of the River Waal.

It is found that without intervening in the river, the River Waal does not reach a (dynamic) equilibrium bed level within the modelled fifty years. The proposed interventions are also not able to stop the erosion; however, they show the ability to reduce the erosion rate locally and close to their location. As the interventions only reduce the river's transport capacity locally, additional erosion downstream is seen, while the bed level upstream shows a capricious response. At the same time, large variability in bed level in transverse direction is observed. Two-dimensional processes, such as secondary flow, may be enhanced depending on the connection of the side-channels to the main channel, leading to a decrease in efficacy of the measures.

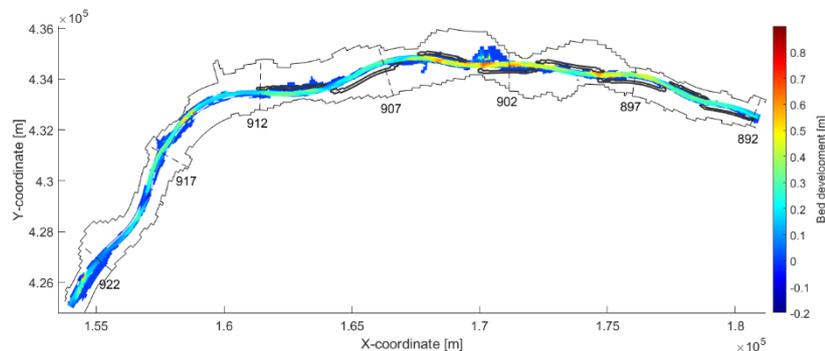


Figure 1: The difference in bed development in the Middle-Waal due to the river interventions proposed in the Room for Living Rivers vision. A positive value indicates a higher bed level after implementation of the interventions. The new side channels are shown in black, while the floodplains have been lowered uniformly in the shown river trajectory.

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