# MODELLING OF MORPHOLOGICAL DEVELOPMENT OF THE VECHT RIVER DUE TO CHANGES IN THE WEIR POLICY


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**Graduation Date:**
31 August 2023



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The Overijsselse Vecht has previously been canalized by cutting off meanders, constructing weirs (Figure 1), and placing revetments. However, in the past decades a new vision was formulated and measures were taken to rebuild the Vecht into a semi-natural river. The characteristics of such a river include the presence of meanders and visible processes of deposition and erosion. However, the weirs in the river block the flow of water and sediment, which is non-fitting for a semi-natural river. A different weir policy that increases the flow through the river is therefore expected to contribute to the achievement of a semi-natural river. Currently, a water level controlled weir policy is maintained, but a discharge controlled weir policy is proposed by the waterboards that maintain the Vecht. However, it is unknown what the effects of the implementation of such a policy would be on the morphology of the river. Therefore morphological model simulations have been done to evaluate the impact of four weir policies: (1) the current weir policy, (2) a discharge controlled weir policy (weirs open at a discharge of 50 $m^3/s$), (3) a discharge controlled weir policy (weirs open at a discharge of 30 $m^3/s$), and (4) the full opening of all weirs at all times.

*Figure 1: Example of a weir in the Vecht near Hardenberg*

For the simulations a 1D morphological model of the Vecht was available, however, it was outdated since many interventions were done in the river since the model was set up. Therefore, the model schematization was updated to include several interventions, and the bed roughness and several sediment transport parameters were recalibrated. This calibration process resulted in an average root mean square error of simulated water levels of less than 15 cm compared to measured water levels, and a root mean square error of simulated bed levels of 40-55 cm compared to measured bed levels. The simulation results showed that locally near the weirs deposition occurs on the upstream side and erosion occurs at the downstream side (Figure 2). Both deposition and erosion are highest for the current weir policy, and smallest for the weir policy where the weirs are always open (Figure 2). Also erosion and deposition waves were observed that propagated downstream, but their movement was blocked largely by the weirs if the current weir policy was maintained. This was not the case if the weirs were opened more often. Lastly, on the large scale an average bed level increase was observed, which was highest if the weirs were always opened and smallest for the current weir policy (Figure 2). This last finding differs from expectations in literature, where it was expected that there would be an average bed level decrease. The reason for this difference could not be explained, so it is unsure what the complete effect of alternative weir policies will be on the morphology of the Vecht. Therefore, it is also unsure if these weir policies contribute to the achievement of a semi-natural Vecht.

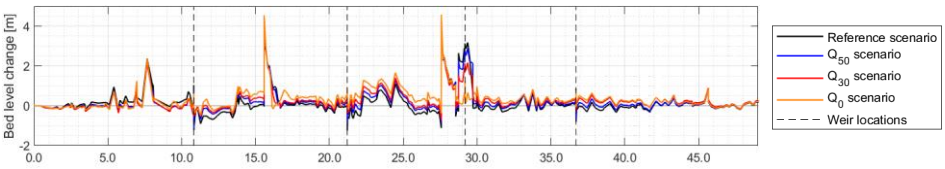


*Figure 2: Simulated bed level change over 50 years for all evaluated weir policies.*

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