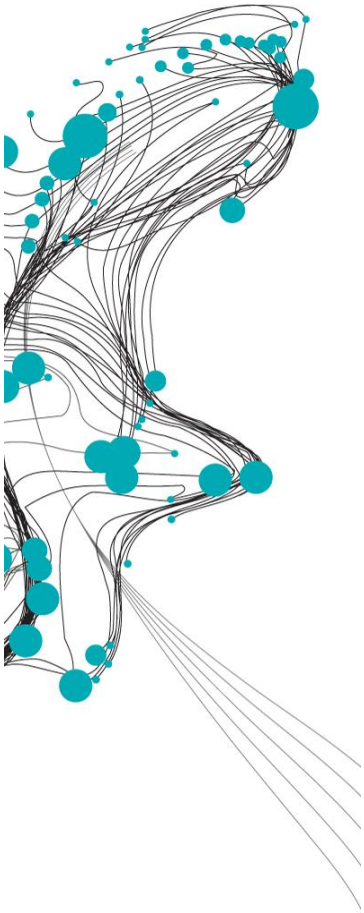
Quantifying uncertainties in the discharge distribution at the Pannerdense Kop



The discharge distribution is crucial for the flood protection of rivers. The water levels downstream of a bifurcation point are determined by the upstream discharge while the discharge distribution is again determined by the water levels downstream (Gensen et al., 2020). Because of the interaction between the discharge distribution and the water levels it is crucial to understand the uncertainties in the discharge distribution for flood risk assessment. The aim of this study is determine the effects of the uncertainty in the discharge distribution at the Pannerdense Kop.

Expert elicitation has been used in this study to quantify the different sources of uncertainty in the discharge distribution of the Pannerdense Kop. First, six different sources of uncertainty have been identified: 1) wind, 2) geometry, 3) roughness of the main channel, 4) roughness of the flood plain, 5) failure of the primary defence and 6) regulation structure Pannerden. The uncertainties have been quantified during interviews with 7 experts and the total amount of uncertainty in the discharge distribution was quantified as well.

The results of the quantification of the individual sources of uncertainty are shown in Figure 1. The quantification is done using the 90% confidence interval. A weighted average is also visible in the figure which is determined by assigning weights to the experts. It is visible that three sources of uncertainty are quantified considerable large by the experts: geometry, roughness of the main channel and the floodplain. Next, a total weighted probability distribution of the discharge distribution towards the Waal is obtained and shown in Figure 2. The bandwidth of the 90% confidence interval is equal to 571 m^3/s. Next, the weighted probability distribution has been set as the upstream boundary condition in a Sobek model for the Waal river and a Monte Carlo simulation has been executed. The found bandwidth of the 90% confidence interval for the water levels of the Waal is equal to 29.1cm.

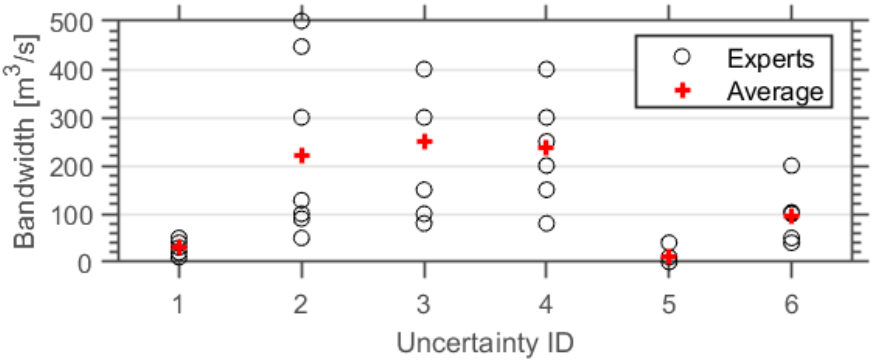


Figure 1: Quantitative results of the quantification of the individual sources of uncertainty. (Uncertainty ID"s as mentioned in the text.)

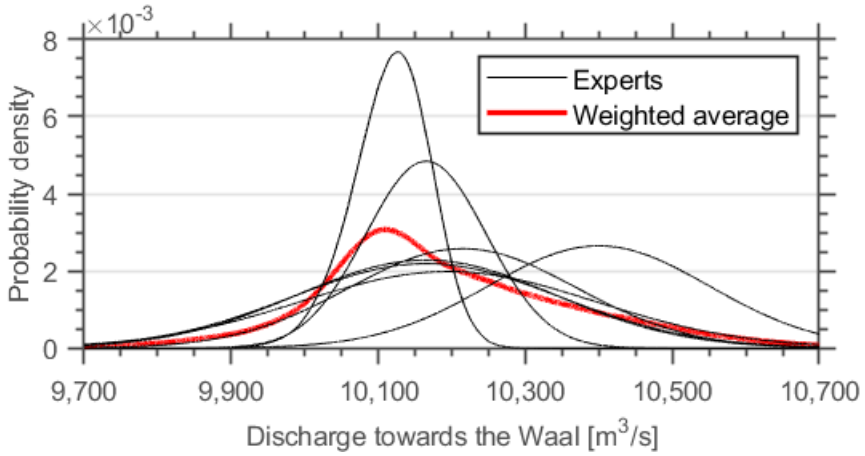


Figure 2: Probability distributions of the discharge distribution towards the Waal.

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References

Gensen, M.R.A., Warmink, J.J., Hulscher S.J.M.H. (2020) Water level uncertainties due to uncertain bedform dynamics in a bifurcating river system. In Kalinowska, M.B., Mrokowska, M.M., Rowiński, P.M. (Eds.), *Recent trends in Environmental Hydraulics: 38th International School of Hydraulics*

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