A Stochastic Model Approach for Optimisation of Lowland River Resoration Works

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Abstract

Over the course of centuries, river systems have been heavily trained for the purpose of safe discharge of water, sediment and ice, and improves navigation. Traditionally, dikes are used to be reinforced and heightened to protect countries from ever higher flood levels. Other types of solutions than technical engineering solutions, such as measures to increase the flood conveyance capacity (e.g., lowering of groynes and floodplains, setting back dikes) become more popular. These solutions may however increase the river bed dynamics and thus impact negatively navigation, maintenance dredging and flood safety. A variety of numerical models are available to predict the impact of river restoration works on river processes. Often little attention is paid to the assessment of uncertainties. In this paper, we show how we can make uncertainty explicit using a stochastic approach. This approach helps identifying uncertainty sources and assessing their contribution to the overall uncertainty in river processes. The approach gives engineers a better understanding of system behavior and enables them to intervene with the river system, so as to avoid undesired situations. We illustrate the merits of this stochastic approach for optimizing lowland river restoration works in the Rhine in the Netherlands.

Keywords: river restoration, flood protection, dredging, navigation, stochastic approach, Room for the River program.

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