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Interactive exploration of fluvial futures

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The World Economic Forum ranked extreme weather events, natural disasters, and failure of climate-change mitigation and adaptation in the top five risks in terms of likelihood as well as in terms of environmental and socioeconomic impact. Managing and adapting densely populated fluvial areas to the combined impacts therefore presents a major challenge for their sustainable development in this century. Common landscaping measures need to be evaluated to compensate for changes in discharge or sea level rise, for example, floodplain lowering, side channel recreation, embankment relocation, roughness lowering, groyne lowering, or removal of minor embankments. Decisions for adaptations require an overview of cost and benefits, and the number of stakeholders involved. For a rational and convincing decision-making process it is desired that stakeholders and planning professionals get easy access to source data, model code, intervention plans and their evaluation.

We used a set of open-source models and software packages to create an interactive tool enabling the exploration of possible futures of fluvial areas in a quantitative manner. The measures are planned and evaluated using RiverScape (Straatsma, 2019) and implemented in the spatio-temporal modelling environment PCRaster (<http://www.pcraster.eu>). For the seamless integration of explanatory text, user-defined parameterization of measures, executing RiverScape model code, and interactive visualization of spatial data we use Jupyter Notebooks (<https://jupyter.org/>). The notebooks provide an interactive working and teaching environment for integral river management, where professionals, stakeholders or scholars can explore different measures from different disciplinary backgrounds: flood hazard reduction, biodiversity, vegetation succession, and implementation costs. In our presentation we illustrate our integral river management workflow of creating own measures, evaluating them in isolation, and interpreting the results by example of the Waal River in the Netherlands.

References:

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