

**Title of the project:**

Long-term analysis of the effect of system changes on model robustness

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**Assignment no.: 14.24****Internal/external:**

External

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**Head graduation committee:**

tbd

**Daily advisor:**

Raymond van Renswoude (RWS-ON)

Anouk Bomers (UT)

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**Name(s) of participating companies or institutes:**

RWS-ON

**Start of the project:**

asap

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**Required courses:**

Hydraulic modelling

River Flow Processes

Experience with Python

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**Short description of the project**

1D river models (SOBEK), operationally used by Rijkswaterstaat, are fully based on detailed 2DH models (DFLOWFM). Every one to two years, an up-to-date 2DH model of the Dutch Rhine river branches is developed. This 2DH model is subsequently used to derive the surrogate 1D model. The 1D model simplifies the detailed high-resolution bathymetry and land use schematisation (Baseline) of the 2D model, to symmetric 1D river profiles with a spatial spacing of 500 m, using the software FM2PROF. Consequently, the river's complex flow processes are simplified significantly in the 1D model. While small changes in the bathymetry or vegetation immediately influence the simulated water level in the 2D model, those changes only have a little effect on the results of the 1D surrogate model. Since setting up the 1D model and calibrating this model according to the 2D model results is highly time-consuming, the question of this research is for which cases it is worth the effort to update the 1D model. In other words, when will changes in the bathymetry and land use in the Rhine river branches have a significant effect on the simulated water levels?

This research firstly focusses on the differences between the 1D models of the Dutch Rhine river branches for different years, and relate these differences to large-scale interventions in the river system (e.g. room for the river projects such as the construction of a side channel, nature relocation projects, harbors). Next, the study focusses on analysing the impact of these river interventions on the 2D model results, and consequently on the cross-sectional profiles in the 1D model and simulated water levels.

This project will mainly be executed at Rijkswaterstaat-Oost Nederland (Arnhem) and partially at Deltares (Delft) for the supervision of the 2D and 1D models, and the FM2PROF software that generates the 1D river profiles.