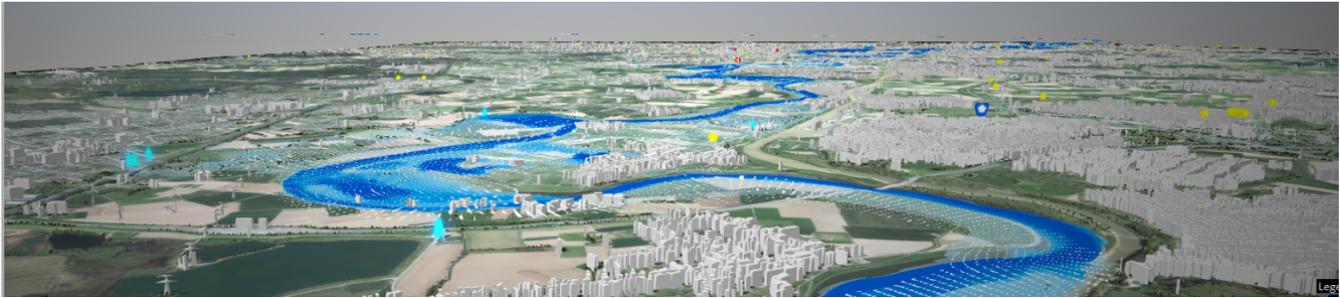


DEL093 - Rivers in D-HYDRO



Motivation

Adaptation of rivers, both hydrodynamically and morphologically, is a process that involves large spatial and temporal scales. Especially when you want to look at adaptations due to climate change (sea level rise, changes in discharge regime) or due to large scale interventions in the system. It is therefore of utmost importance to be able to predict the (long term) development of rivers on larger scales. This gives the need for appropriate numerical models and accompanying software.

This TKI project focusses on larger spatial scales and (long term) morphology. With these requirements a 1D modelling approach, with 2D and 3D parts where needed, appears to be the best choice. The widely used 1D simulation software for rivers, the SOBEK-suite, does not fulfill the demands that are currently set for the support in integral river management. For this purpose, we utilize the 'state of the art' D-HYDRO (or 'Delft3D-FM') Software Suite that integrates multi-dimensional approaches in one package. The D-HYDRO Suite is a dynamic modelling platform, where innovative water software meets and connects to the continuous change in problems coming from the water sector. D-HYDRO is an open source product and has a large (international) user community.

The core of the Delft3D-FM software is a completely new computational core (D-Flow FM), which has been developed in the past years, in first instance with a focus on 2D applications (with a novel flexible mesh approach) also in combination with morphology. Lately the development for 3D applications has been further enhanced and also the application to 1D-2D systems for the regional water boards and rural areas is taken into account. However, the possibilities for 1D modelling of rivers is lagging behind and further disclosure of specific features for this application is needed to be able to perform integral river studies

Goal

The overall goal is to boost integral river modelling both nationally and internationally to be able to answer complex questions in the future. This is done by developing and disclosing specific modelling techniques within state of the art software (D-HYDRO Suite) and making them available to the whole river community.

This overall goal related can be divided in multiple sub-goals:

1. Improving the 1D functionalities within the hydrodynamic computational kernel of the D-HYDRO Suite (e.g. complex steering of structures, supercritical flow).
2. Improving the 1D functionalities within the morphological computational kernel of the D-HYDRO Suite (e.g. sediment distribution over bifurcations, sediment through structures).
3. Testing the new modelling techniques in two international pilot projects.
4. Making the new software and testmodels available to the whole river community.

Activities

Within this project the following activities have been performed:

- Implementing and testing of complex steering possibilities of structures in 1D within the D-HYDRO Suite
- Improvement of the available relations for the sediment distribution over bifurcations and confluences in 1D within the D-HYDRO Suite
- Including the possibility for adding laterals (including sediment) in 1D within the D-HYDRO Suite
- Validation of the application for 1D supercritical flow in rivers within the D-HYDRO Suite
- Performing a pilot study with Hydrotec on a river in Austria (supercritical flow and complex structures)
- Performing a pilot study with Jpower on a river in Japan (sediment transport over structures and confluences)

Results

The following results are obtained within the project:

- An alpha project version of the D-HYDRO Software package with the new developed functionalities
- Several testcases for the functionalities in the software
- Two pilot models using the new functionalities, including reports
- Four students have completed (part of) their internship by contributing to this project

Consortium

The consortium of the project consisted of the following members:

- [Hydrotec](#)
- [JPower](#)
- [HKV](#)
- [RHDHV](#)

Theme's

The project contributes to the following KIC's:

- Water & ICT
- Water safety
- Water management

Links

Software and test models are available via the [RiverLab platform](#)

This TKI-project is also related to the following TKI-projects:

- [DEL045 - Improving sediment management in river systems with reservoirs](#)
- [DEL060 - D-HYDRO Suite, Urban](#)
- [DEL073 - D-HYDRO voor waterschappen](#)
- [DEL092 - Hydrologie in D-HYDRO](#)