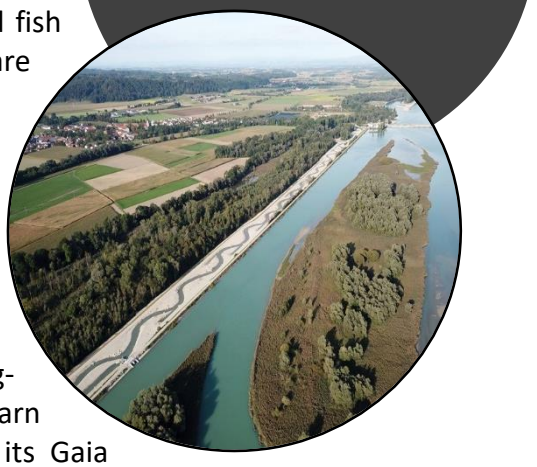
Universität Stuttgart

IWS Department of Hydraulic Engineering and Water Resources Management
Prof. Dr.-Ing. Silke Wieprecht

M.Sc. Topic

Two-dimensional (2d) hydro-morphodynamic numerical modeling of a fish bypass



Background

Hydropower is one of the largest renewable energy source in Europe, but it can also affect river ecosystems by cutting off sediment transport and fish migration paths. To enable fish passage besides dams, bypass channels are implemented at many low-head hydropower stations. In recent years, the design of fish bypass channels evolved from concrete stairways to morphodynamic side channels with multiple ecosystem functions. To evaluate the success of multi-functional ecosystem restoration and for the planning of future projects, the role of digital twins in the form of numerical models becomes increasingly important and dominant, as well. To this end, this Master's Thesis has the objective of building a hydro-morphodynamic 2d numerical model of a fish bypass at the Ering-Frauenstein hydropower plant (Inn River, Bavaria). The student will learn and apply the powerful open-source software suite TELEMAC with its Gaia module for modeling sediment transport. The Thesis integrates into a larger project framework with the Massachusetts Institute of Technology (MIT) for enhancing river restoration efforts.

Thesis Overview

1. Literature review on sediment transport with a focus on 2d numerical models.
2. Familiarize with the Telemac2d and Gaia.
3. Set up a hydrodynamic 2d-numerical model of the Ering-Frauenstein bypass channel with Telemac2d.
4. Implement sediment properties and enable sediment transport simulation with Gaia.
5. Run and calibrate the hydro-morphodynamic model.
6. Interpret the simulation results.

Desirable Skills

Interest in hydro-morphodynamics and basic understanding of numerical models.

Apply now!

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The thesis can be written in German or English.

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