DIGITAL TWIN OF A RIVER REACH – VIRTUAL SANDBOX TO EVALUATE CURRENT AND FUTURE SCENARIOS – A VISION

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Goal

Develop an interactive tool (a digital sandbox) for river reaches that shows the current flow conditions in the river, using a combination of hydraulic modelling and online measurements and where different hydraulic parameters can be varied to foresee their impact on the flow conditions in the reach. The results, such as water depths and velocities, are then presented in a graphical interface with post-processing and data analysis capabilities.
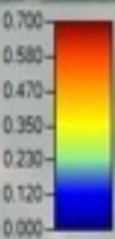

Vision

We have the tool in hand.

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Some related questions

- How can the state-of-the-art of hydraulic modelling (1D, 2D, 3D) and field measurements be combined to create, calibrate and validate digital models of river reaches?

- Can the whole catchment be included?

- How can AI and machine learning be integrated to improve the results?

- How can the utility and user experience of the developed models be improved using digitalization measures?

- How can the developed tool be applied to assess environmental and social impacts of historical, current or future flow scenarios?

- How can the relevant hydraulic conditions for riverine biodiversity such as habitat or benthic fauna be visualized and analysed?

For whom?

Knowledge, measurements and modelling

A few examples of SVC projects towards vision

## Knowledge

In-house knowledge at power companies

Photo from Svenska kraftnät

Morphological measurements to promote biodiversity in hydropeaking reservoirs, Roland Jansson, Umeå university

Measurements

Photogrammetry for flow measurements at hydropower plants with no operational restrictions or limitations, Hang Trieu, Luleå university of technology
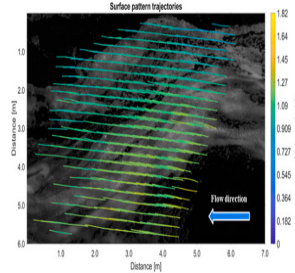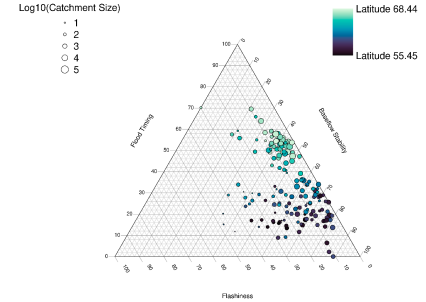

Trieu et al

Experimental dam, Älvkarleby, Several projects, Vattenfall, KTH, LTU

Bernstone et al

Modelling

Uncovering causes of salmon recovery in a hydropower regulated river – a new modeling approach, Eva Bergman, Karlstad university

Digital Twins of Regulated River Stretches, Frida Niemi, Luleå university of technology

Examples of knowledge, measurements & modelling useful for the vision

- Knowledge about river management
- Knowledge about regulations
- Knowledge about costs and income
- Knowledge about erosion
- Knowledge about conditions for flora and fauna
- Hydrological modelling
- Hydraulic modelling

- Hydrological in-situ measurements
- Hydraulic in-situ measurements
- Security measures
- Etc etc

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