



**Euro-FLOW: a European training and research network for environmental FLOW management in river basins.** A MARIE SKŁODOWSKA-CURIE ACTIONS Innovative Training Network (ITN) funded under H2020-MSCA-ITN-2017

**ESR 2: Linking the ecological effects of e-flows with sediment regimes in rivers**

**3 year fixed- term PhD position.**

**Host institute:** Eawag (Swiss Federal Institute of Aquatic Science and Technology)

**Supervisors:** Dr Chris Robinson (Eawag), Dr Guido Zolezzi (University of Trento), Dr Rudi Haller (Swiss National Park)

**Project Description:**

Environmental high flows are being implemented globally. Understanding the effects of e-flows on stream ecology is paramount to developing and implementing effective e-flow programs. This PhD aims to develop an understanding of flow-sediment-physico chemistry interactions with ecological processes in rivers subject to e-flows. The river Spöl in the Swiss National Park will be the case study system with over 30 e-flows being implemented in the last 18 years. This dataset along with other available datasets around the world will be used to quantify how major ecosystem processes respond to river flow modifications, i.e., environmental high flows. The study will examine the interaction of e-flows with sediment dynamics in affected rivers and their influence on river functional properties (e.g., ecosystem metabolism, primary production, benthic processes). System dynamics will also be assessed using current mapping techniques (drone technology, UAVs with ADP) and GIS software based analysis.

**Objectives:**

- (1) Mapping of flow and sediment dynamics in the upper and lower Spöl using high resolution geomorphological techniques (e.g. UAVs with digital image acquisition and thermal imaging, laser scanning, structure from motion).
- (2) Experimentation with environmental flows in BACI designs to observe impacts of flow manipulations on multiple ecosystem properties.
- (3) Link sediment dynamics with ecosystem functional properties (metabolism).

**Expected outcomes:**

- 1) New understanding of geomorphic and sediment response to flood flows in hydropower regulated rivers.
- (2) Driving role of abiotic habitat in ecosystem functional dynamics (e.g. sediment metabolism).
- (3) Knowledge of links between flows, habitat and invertebrate production

**Secondments:**

Swiss National Park, total of 7 months over years 1-3 for planning and implementation of experiments, data collection and dissemination.

Engadine Kraftwerk (hydropower company), 2 months to plan experimentation and implement flow trials.