



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 1: Designing the ideal river flow regime: designer flows for delivering good ecological potential in regulated rivers

3 year fixed- term PhD position.

Host institute: University of Leeds, UK

Supervisors: Dr Megan Klaar, Dr Jonathan Carrivick (University of Leeds)
Joanne Baxter (Yorkshire Water) and Dr Judy England (Environment Agency)

Project Description:

Rivers downstream of man-made structures such as dams and reservoirs are significantly altered from their natural state, and as such, environmental objectives must reflect this modified condition. One way of managing heavily modified water bodies (HMWBs) is the use of artificial flow regimes which are designed to provide the requirements of both the river ecosystem (e.g. flood and low flows, *sensu* the natural flow paradigm) and meet the consumptive duties placed on the river. The regulated release of water to mimic natural flow elements such as floods, freshets, low flows, and aspects of flow variability are predicted to maintain the hydrogeomorphic integrity of river habitats, ensuring that they reach good ecological potential as required by UK and EU law. Environmental flow standards provide guidance to optimise flow releases from water storage reservoirs. However, there is little empirical evidence to say how successful these standards are in establishing and maintaining ecological potential, the geomorphological impacts of the flow regimes and how we can deal with the complexity of the competing needs of species (e.g. fish and vegetation) and water use (e.g. agriculture vs public water supply, implications for flooding) which further constrict management objectives.

Yorkshire Water (YW) owns and operates a number of reservoirs in the Yorkshire area which, supplies water throughout its region and is committed to improving the environmental condition of rivers. YW is able to manage the release of water from a number of its reservoirs in the Pennine area of Yorkshire, enabling the set-up of a controlled experiment in which the timing, magnitude and frequency of flow events can be managed in order to assess how designed flow events affect instream habitat, biota and ecosystem processes. The successful ESR candidate will test the existing environmental flow standards, design and implement a number of designer flows and, examine how altered flow regimes can be implemented to provide the dual needs of both the environment and society. They will work with other Euro-FLOW ESRs to determine the future of designer flows in the management of regulated rivers.

Objectives:

- (1) Set up experiments to assess how the timing/ magnitude/ frequency of flows affect geomorphological processes and habitat quality for instream biota.
- (2) Monitor geomorphological changes and the ecological consequences of habitat quality and quantity changes.

(3) Use the concept of 'designer flows' as a template for providing hydromorphological integrity to rivers downstream of reservoirs.

Expected outcomes:

(1) An understanding of geomorphological response of Pennine rivers to reservoir flow manipulation which can be used to develop a geomorphological risk assessment to aid in the management of flows.

(2) New spatio-temporal understanding of geomorphological drivers of whole river ecosystem processes (e.g. production/ respiration).

(3) Information on flow-habitat-functional process linkages to underpin design of reservoir outflow regimes.

Secondments:

Yorkshire Water, total of 6 months over years 1-3 for planning and implementation of flow trials, data collection and dissemination.

Environment Agency, 3 months in year 3 to develop evidence links to back up policy guidance.