



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 3: Integrating water quantity and quality in eco-hydrological relationships

3 year fixed- term PhD position.

Host institute: NERC Centre for Ecology and Hydrology (CEH), UK (degree awarded by University of Leeds, UK)

Supervisors: Dr François Edwards, Dr Mike Hutchins (CEH), Dr Megan Klaar (University of Leeds), Sian Davies (Environment Agency), Dr Nataša Smolar-Žvanut (Slovenian Water Agency)

Project Description:

The trade-offs between the conservation of river ecosystems and the supply of water for human needs are an important challenge for the EU and its member states. Two conflicting drivers must be addressed, on the one hand environmental legislation requires more water to remain in rivers, and on the other hand human development dictates more water usage. Adequate 'environmental flows' are necessary to support good ecological status of rivers and maintain key river habitats under favourable condition as required by EU regulations. However, a certain level of water quality is also necessary to comply with these environmental laws and meet society's needs.

Because flow determines the concentrations of dissolved chemicals, retaining sufficient environmental water is essential to dilute pollution from sewage inputs as well as from diffuse sources, such as run-off from agricultural and urban areas. The process of assigning suitable environmental flows (e.g. aquifer and surface abstraction rates, reservoir or dam releases, flow augmentation schemes) is complex because it must satisfy the diverse flow requirements of a range of river plants and animals, while also modulating water quality.

The studentship will produce a framework for environmental flow setting that spans river types, biotic groups and the nature of the flow regulation, and also delivers key aspects of water quality. To support the framework a process-based river network model is available. It has been configured in the form of a sensitivity analysis to assess the impact of combinations of two or more climatic- or management-induced stressors on eutrophication. It can be used to identify the extent to which combinations of stressors act synergistically, and the intention is to expand its scope (i) to more-specifically represent flow regulation scenarios (ii) to link with novel assessments of a wider set of biotic indicators. By analysing existing datasets, gathering new field measurements at key times/locations and setting up bespoke models, the research will generate new understanding of how water quantity and quality can be co-managed to maintain and enhance river ecosystems and the services humans derive from them. The research programme will include placements with national water regulatory agencies.

Objectives:

(1) To define sets of water quantity/quality requirements for multiple biotic groups (fish, invertebrates, plants, algae) using existing datasets. New data gathered with flow gauging and water sample analyses,

including use of sensor-based continuous monitoring to characterise ecosystem metabolism, will be used to further investigate key aspects such as flow extremes and specific management contexts

(2) To examine through modelling approaches whether these requirements of flow (e.g. minimum flow, flow variability, flood pulse frequency) and water quality (e.g. nutrients, temperature, sediment) are independent, interactive or additive for the different biotic groups

(3) To explore the links and feedbacks between flow and water quality requirements across different river types with different pressures in terms of their flow regulation and water pollution

Expected outcomes:

(1) A new holistic framework of environmental flow assessment for multiple biotic groups

(2) A classification of water quality/quantity requirements mapped onto a river typology

(3) Comparative models for rivers with different flow regulation pressures

Secondments:

Slovenian Water Agency, 3 months in year 2 or 3 for analysis of flow-habitat-water quality linkages

Environment Agency, 3 months in year 2 or 3 to develop evidence links to back up policy guidance.

Eligibility Criteria:

* Applicants must not have resided or carried out their main activity in the UK for more than 12 months in the 3 years immediately prior to their recruitment¹.

* Applicants must hold a first degree and/or Masters degree in an environmental sciences subject (e.g. hydrology, ecology, environmental management etc), and be highly motivated to work in an international team including frequent travel between the Euro-FLOW beneficiaries and project partners.

* Applicants must not have more than 4 years (full time equivalent) research experience at the date of their recruitment¹. This is counted from the date they obtain the degree that would let them start work on a doctorate. They must not have been awarded a doctoral degree.

* Some experience of data modelling and analysis are required. Skills either in programming and/or GIS would be advantageous.

* Applicants must have excellent written and spoken English skills.

Other requirements: Full driving license (UK/EU)

¹Date of recruitment is defined as the first day of the applicant's employment i.e. the start date indicated in their employment contract.

EuroFLOW Information:

The regulation of river flows is one of the biggest stressors affecting river ecosystems across the world. In many countries, major legislative efforts are therefore underpinning the development of new approaches to mitigate the impacts of river flow regulation. These approaches are based on optimising the management of river flows to maintain services to humans (e.g. water supply, hydropower) whilst protecting and/or rejuvenating the aquatic environment with water of adequate quantity and quality in space and time (i.e.

environmental flows). In this context, a field of applied aquatic science has developed to generate the evidence base for identifying the best ways to manage the quantity, quality and patterns of environmental flows to sustain river ecosystems, Euro-FLOW will train a new cohort of researchers to be future leaders in this field. Within Euro-FLOW, 15 early-stage researchers will develop new theoretical and empirical insights via ground-breaking experimental manipulations, large-scale field surveys and development of cutting-edge models to inform the management of water flows and aquatic ecosystems in river basins. Future research leaders will be developed through advanced training in: (i) river ecosystem science in relation to environmental flows; (ii) transferable scientific and life skills; (iii) collaborative working with international and inter-sectoral networking. Euro-FLOW will produce scientists with the ability to span subject boundaries, e.g. hydrology, geomorphology, geochemistry, ecology, microbiology, modelling and environmental management. The strong involvement of the non-academic sector will provide the PhD students with a holistic perspective on career opportunities.

Application details

The application should contain a cover letter that states your motivation, a CV and supporting documents about your education and studies (i.e. transcripts, certificates) and professional experience where applicable and two references. If you are applying for more than one EuroFLOW position, please rank your preferred projects.

Contact Dr Francois Edwards fed@ceh.ac.uk for information on how to apply

Closing date: 30 November 2017

Post start date: February 2018