



**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 9: Linkages between river habitat dynamics and channel morpho-dynamics at the mesoscale**  
**3 year fixed- term PhD position.**

**Host institute:** University of Trento, Italy (UNITN)

**Supervisors:** Dr Guido Zolezzi, Dr Paolo Vezza (UNITN), Dr Martina Bussetini (Institute for Environmental Protection and Research- ISPRA, IT), Dr Chris Robinson (Swiss Federal Institute of Aquatic Science and Technology-EAWAG, CH)

**Project Description:**

Studies aimed at assessing the spatial and temporal availability of river habitat for different biological species mainly assume a static configuration of the river channel. Existing habitat-based methods for environmental flow design and assessment do not explicitly incorporate morphological changes in the relation between habitat availability, sediment transport and channel (bio)morphodynamics at the relevant scales. At the flood event time scale, river morphodynamics may determine a strong spatial rearrangement of the habitat template, both in the wet channel and in the exposed morphological units at low flow. At larger time scales, trajectories of channel adjustments may force dramatic shifts in the ability of a river reach to support habitat diversity at given turnover rates.

The proposed doctoral research topic aims to address the relation between river habitat dynamics and channel morpho-dynamics at the relevant spatial and temporal scales, with a focus on both the habitats in the wet channel and in the dry morphological units at low flow conditions, to encompass habitat conditions of relevance for both fish and terrestrial species, as in the case of birds hatching on bare sediment bars.

This project also benefits from being closely linked to research by other postgraduate and postdoctoral researchers investigating low flow impacts on stream ecosystems. The successful candidate will also gain from being part of a large, interdisciplinary, water research team based at the University of Birmingham.

**Objectives:**

- (1) To quantitatively assess the variability of mesoscale habitat structure due to morphological changes in the river corridor at different time scales (i.e. flood event, decadal), with focus on both the dry channel and the wet channel.
- (2) To extend the applicability of mesoscale habitat models at non-wadeable, morphologically complex conditions (i.e., high discharge, large streams) through hydro-morphodynamic modelling;
- (3) To develop morphodynamic-sensitive habitat metrics and to assess their use for e-flows design and monitoring over time scales encompassing multiple formative events (decadal or multi-decadal time scale)

**Expected outcomes:**

- (1) Assessment method for temporal persistence of habitat-discharge rating curve across different channel patterns;
- (2) Upgraded mesoscale habitat model applicable to a range of river conditions;
- (3) Novel “morphodynamic” habitat metrics, accounting for river dynamics/sediment transport

The research will adopt the mesoscale habitat modelling approach and will integrate morphodynamic modelling, field data collection, analysis of morphological change and habitat time series and the application of suitable distribution models for target biological species. Case studies in river with different morphologies and rates of morphological changes will be preferably chosen among sites already subject to habitat modelling in the North of Italy.

**Secondments:**

One secondment is foreseen at EAWAG (Switzerland), to apply the developed approach on the case study of the Spol River (CH) subject to a unique program of environmental and geomorphic flows for more than a decade. A 3-month secondment to ISPRA – the Italian National Agency for Environmental Research and Protection – will focus on the integration of the proposed approach in existing e-flow assessment frameworks for their possible improvement.

**Eligibility Criteria:**

- \* Applicants must not have resided or carried out their main activity in Italy for more than 12 months in the 3 years immediately prior to their recruitment<sup>1</sup>.
- \* Applicants must hold a first degree and/or Masters degree in an environmental science subject (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 recruitment<sup>1</sup>. 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 freshwater ecology is required. Skills in stream metabolism measurement, invertebrate or algal taxonomy, and/or statistical analysis using R would be advantageous.
- \* Applicants must have excellent written and spoken English skills.

**Other requirements:** Full driving license (UK/EU)

<sup>1</sup>Date 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**

This position has now been filled.