



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 4: Linking environmental flows to changes in river ecosystem structure and functioning mediated by water chemistry and biotic interactions

3 year fixed- term PhD position.

Host institute: Norwegian Institute for Water Research, NO (NIVA)

Supervisors: Dr Nikolai Friberg (NIVA), Dr Asbjørn Vøllestad (University of Oslo, NO), Dr Hamish Moir (CBEC EcoEngineering, UK), Dr Mark Ledger (University of Birmingham, UK)

Project Description:

Norway produces approximately half of Europe's hydropower generated electricity and 70 % of Norway's rivers have consequently changed hydrological regimes. While direct effects on biota, in particular salmonids, are well documented, much less is known of how changed hydrological regimes indirectly influence biotic interactions and ecosystem functioning. Furthermore, water released from hydropower reservoirs will often differ in temperature regimes, gas saturation and water chemistry compared to unimpacted rivers. This, together with changes in sediment transport and geomorphic process rates, that are inherent features of changes to natural flow conditions, will significantly alter the environmental conditions at all levels of biological organization, and it has profound implications for ecosystem properties. In particular, we are interested in how this combined impact of hydropower influences interaction among autotrophic components in river ecosystems and the cascading effects further up in the food web. We are furthermore interested in quantifying changes in ecosystem functioning such as metabolic balance, primary and secondary production and rates of decomposition, and to link these changes to alterations in flow, temperature, geomorphological processes, gas saturation and water chemistry. We expect to translate changes in ecosystem functioning to the provision of key ecosystem services such as a sustainable recreational fishing that is a key source of rural income in many parts of Norway. We envisage a combination of using existing data sets, new field surveys and experiments to disentangle these complex abiotic and biotic interactions in relation to hydropower development. We expect that the PhD student will study component parts of this complex in more detail than other parts, depending on personal interest and competences, as well as logistic challenges.

Objectives:

- (1) To elucidate mechanisms by which changed hydrological regimes and environmental conditions influence interactions among autotrophic components;
- (2) To investigate the direct and indirect (biotic) effects of reduced flow on benthic macroinvertebrates and fish;

(3) To investigate how overall ecosystem metabolism, primary and secondary production and organic matter decomposition are influenced directly and indirectly by changes in flow, related environmental conditions and biotic interactions.

Expected outcomes:

(1) Understanding of the main drivers of changes in the composition of autotrophic components and how flow can be managed to avoid direct negative impacts on cultural services from e.g. nuisance growth;

(2) Quantification of how autotrophic components can indirectly influence ecosystem structure and functioning, and the provisioning ecosystem services (biodiversity, nutrient-cycling, secondary production of fish);

(3) An ecosystem understanding of cascading effects arising from the interplay between flow conditions and biotic interactions that can conceptually be transferred to other systems.

Secondments:

University of Birmingham, UK for 3 months in Year 2 to undertake controlled mesocosm experiments

CBEC, UK for 3-6months in Years2/3 to undertake hydraulic modelling

Eligibility Criteria:

* Applicants must not have resided or carried out their main activity in Norway 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 ecology, environmental science or a related discipline, 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.

* Experience of river ecosystems, including invertebrates, algae and/or fish are also required

* Applicants must have excellent written and spoken English skills.

Other requirements:

Full driving license (EU) to complete the field-based elements of this PhD.

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 Nikolai Friberg Nikolai.Friberg@niva.no for information on how to apply

Closing date: 30 November 2017

Post start date: February 2018