

ESR Project 7

Assisting decision making with water quality predictions based on short-term weather forecasts

Host institution: Dundalk Institute of Technology (DkIT), Dundalk, Ireland

Supervisor: Prof. Eleanor Jennings

Co-Supervisor: Dr. Don Pierson (Uppsala University)

The successful Early Stage Researcher will be registered in Dundalk Institute of Technology in a three year PhD programme and the doctoral degree will be awarded from Dublin City University.

Project description

Despite advances in water treatment technologies, toxic disinfection by-products (DBPs) in drinking water remains an issue in regions with high levels of dissolved organic matter (DOM) in potable water sources including in Ireland. Workflows combining lake and catchment models of DOM with weather forecasts can be used to provide short-term water quality forecasts to support decision making. Often, however, the resulting outputs are not fit for purpose as they are question- rather than solution-driven. All such forecasts and especially those based on model chains, also have large uncertainties which can devalue their use in decision making and management.

The successful applicant for this position will collate information on real-world management decisions and mitigation measures in two countries where high DOM levels are common, Ireland and Sweden, further develop a modelling workflow for short-term forecasts of DOM developed in previous projects and run the framework for multiple sequential short-term simulations using historical data (or years with contrasting climatic conditions) to assess how often such mitigation measures would need to be taken. The project will also aim to undertake multiple short-term simulations of future change in DOM using ISIMIP climate data to assess future frequency and scope of such decisions, and the extent of any mitigation actions and look at options for potential decisions under current and future climates based on Robust Decision Making.

Expected Results:

1. Collate information on real-world management decisions and mitigation measures in two countries where high DOM levels are common - Ireland and Sweden.
2. Further develop a modelling workflow for short-term forecasts of DOM based on the results from PROGNOS (2016-2019), modelling tools developed through GLEON, and Partner Organisation the Ecosystem Dynamics and Forecasting Lab (Virginia Tech).

3. Run the modelling framework for multiple sequential short-term simulations using historical data (or years with contrasting climatic conditions) to assess how often such mitigation measures would need to be taken.

4. Undertake multiple short-term simulations of future change in DOM using ISIMIP climate data to assess future frequency and scope of such decisions, and the extent of any mitigation actions. The analysis of potential decisions under current and future climates will be based on Robust Decision Making.

Host laboratory

The Centre for Freshwater and Environmental Studies (CFES) is an active and vibrant research centre within the School of Health and Science in DkIT (Director: Prof. Eleanor Jennings). The CFES engages in inter- and multi-disciplinary research that investigates environmental issues and evaluates effective solutions and currently has 30 members. CFES is currently involved in a number of large-scale projects that are addressing complex cross-disciplinary issues that have a regional, national, and international focus that fall under three themes. This project will come under the Lake and Catchment Management theme (Theme lead: Dr Valerie McCarthy) which also has strong links with the Marine Institute staff involved in research in the Burrishoole catchment in Mayo on the west coast of Ireland (a GLEON site), who are also an inventWater partner.

Dundalk is a small town (population 35,000) on the east coast of Ireland, 1.5 hours from Dublin by bus or train and from Dublin Airport. This lively town, typical of many Irish small towns, with a central shopping area that also includes many pubs and restaurants. The town sits on Dundalk Bay and therefore has many local beaches and coastal walks, and is also close to the beautiful Cooley Mountains which offer many opportunities for walking and hiking.

Secondments

The fellowship will also include opportunities to work with other inventWater partner organizations:

- One month secondment with An Fóram Uisce to undertake a review of mitigation actions for high DOM and to assess Irish data;
- One month secondment with Dr Don Pierson in Uppsala University to facilitate data collation on Swedish treatment systems;
- One month at Virginia Polytechnic Institute and State University (USA) to receive training in ecological forecasting.
- Two months in total with University of Stirling with Dr Ian Jones on lake atmospheric dynamics

Specific requirements

- **Academic skills:** Candidates must have a primary degree (honours level) at a 2-1 equivalent in either environmental science, environmental engineering, bioinformatics, or similar.
- **Technical skills:** strong mathematical ability and some programming skills in typical scientific programming languages (e.g., Matlab, Python, R, etc.); strong skills in statistical analysis; strong interest in water resource management.
- **English language:** Any applicant whose first language is other than English must have either a certified English language proficiency of at least IELTS 6.5 or equivalent, or have undertaken their qualifying degree through English.
- **Additional desirable requirements:** experience in dynamic modelling, especially in relation to water resources; experience in handling very large data sets.
- **Driving licence:** a current EU driving licence would be desirable.

HOW TO APPLY

Download the application form from this link: <http://u.pc.cd/LP8ctaK> and fill it. The application form, together with an official copy of degree(s) (if applicable, an official English translation), course transcripts (if applicable, an official English translation), and English proficiency test results cited in the form, must be sent as a **SINGLE** pdf in a **SINGLE** email to *inventWater-jobs@icra.cat*.

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For additional information on this project, please contact Prof. Eleanor Jennings (eleonor.jennings@dkit.ie)



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