

ESR Project 14

Forecasting trade-offs between the food-energy-water-environment nexus and opportunities for adaptation

Host institution: Vrije Universiteit Brussel (Belgium)

Supervisor: Ann van Griensven

Co-Supervisor: Katja Frieler (PIK Germany)

The ESR will be enrolled in the 4-year program of PhD in Science and Engineering of the Vrije Universiteit Brussel.

Project description

A growing and developing populations puts more demand on food and energy production while climate change impacts may have (mainly negative) effects on the productivity. The objective of this study is to have a tool that can predict water quality under global change scenarios and that is able to assess trade-offs and synergies between the food-energy-water-environment nexus. In this project we aim to tackle this by 1) model integration considering water quality and food and energy production using an integrated model composed by (SWAT+ (linking agriculture-water-environment) 2) model application for water quality simulation at small to global scales using SWAT+ and model evaluation using local and global datasets for flow data, water quality data, crop yields including remote sensing products 3) multi-sectoral analysis including trade-offs within the food-energy-water-environment nexus for different ISIMIP scenarios climate and land cover scenarios through improved reservoir representation and reservoir management optimisation.

Expected Results:

1. Models able to simulate water quality from small to large scale using SWAT+
2. Impacts of climate change and land cover scenarios on water quality
3. Trade-offs and synergies for food-energy-water-environment nexus for several reservoir-catchment systems under different ISIMIP adaptation scenarios

Host laboratory

The Vrije Universiteit Brussel (VUB) is a dynamic and modern university with almost two centuries of history and an ideal partner for prestigious international research and education with a European and global perspective. Ranked #189 in the world, VUB offers high quality English-taught Bachelor, Master, PhD and certificate programs. All fields of study are represented, meaning that students can gain a view extending above and beyond their own discipline. Courses are taught by eminent academics and business professionals, operating an open-door policy for students. With more than 150 internationally recognised research teams, VUB prepares students in many disciplines of fundamental and applied research. Thanks to the creation of more than 25 spin-offs in various domains, VUB plays a prominent role in attracting and instigating new economic activity on and around its campuses. VUB counts over 16,000 students, 21% of which are international, representing about 130 different nationalities.

The department of hydrology and hydraulic engineering (HYDR) focus on the numerical modelling of the quantity and the quality of surface water and groundwater from local to global scales, on the innovative use of remote sensing techniques with respect to the modelling and on the development of model calibration techniques.

Since 1976 the department has traditionally been able to attract many international MSc and PhD students and research funds at regional, national and international level. The department is also co-organizing two International (Master) Course Programs, with the universities of Leuven and Ghent, in the field of water (IUPWARE) and soil engineering (physical land resources). The department is thus well embedded in the regional, national and international scientific and professional world of its discipline.

<http://www.hydr.vub.ac.be/>

Secondments

This project is carried out in strong collaboration with the following groups, and visits to their laboratories is expected during the project. A willingness to travel and spend time abroad is therefore essential:

- IIASA (Yoshihide Wada), 4 months (Month 18-21) - joint large scale water quality model application and evaluation and familiarizing with modelling economical aspects;
- PIK-ISIMIP (Katja Frieler), 3 months (Month 20 to 22) - connecting ISIMIP data with lake water quality impact models

Specific requirements

- The candidate must hold a Master's degree from or equivalent to a Master degree awarded in the European Higher Education Area.
- Master's degree must be in civil engineering or environmental sciences in the field of hydrology, ecohydrology or water resources engineering/management
- Technical Skills required: handling of large datasets, data analysis and application of modelling tools, good programming skills are an advantage.
- Systems' Understanding desirable: approaches in water resources management and water governance, basic knowledge about processes affecting water quality in freshwaters.
- Proficiency in the English language is required, as well as good communication skills, both oral and written. Applicants from non-Anglophone countries or for those that have not completed their higher education with English as the language of instruction must include an English certificate in the application package (e.g. IELTS, TOEFL, Cambridge English)

HOW TO APPLY

Download the application form from this link: <http://u.pc.cd/LP8ctalk> 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. Ann van Griensven (ann.van.griensven@vub.be)



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