

Research topic and opportunity for CSC grant-applicant at the Radboud University – The Netherlands in cooperation with the Institute of Hydrobiology - China

Topic: Efficient nutrient and energy recovery from polluted water using a combination of biological and biogeochemical processes in tropical regions

State of affairs

Although China has several high-tech wastewater treatment facilities, a large portion of its (municipal) wastewater is still untreated. Conventional waste water treatment facilities are too expensive to be implemented at a large scale within a short time frame. Current affairs cause multiple environmental and societal (including health) problems. Additionally, due to an increasing scarcity in natural resources, waste is more and more commonly being seen as a source of valuable resources such as nutrients and energy. Biological treatment in combination with biogeochemical processes bring opportunities to recover most of the phosphorus and to simultaneously produce biomass for the production of renewable energy.

The concept of using biota to remove dissolved and suspended substances from waste waters is not new, but still many - in temperate climates - constructed wetlands with emergent macrophytes often fail when it comes to the removal of phosphorus (P), especially after some time of being in use when the soil has become saturated with P. Additionally, as most of the 'first year's P load' is bound to the sediment it is very difficult to recover P for subsequent use as, for instance, fertilizer. For this reason, researchers from the 'Aquatic Ecology and Environmental Biology' group of the Radboud University have developed a new type of biological treatment system based on a biocascade combining soil adsorption and biological removal of nutrients (Fig. 1). The system is composed of different compartments with species of emergent and submerged macrophytes connected in series. The systems works well for the removal of nitrogen (N) and the recovery of P. Our next step is **to adapt this biocascade for use in subtropical and tropical regions**. The PhD candidate will have the liberty to develop her/his own research line within the context of (1) the optimization of the P-recovery in the biocascade system, developed for temperate climates, and (2) the adaption of this biocascade for tropical and subtropical climates (which species and which sediment can best be used?).



Figure 1: The pilot treatment systems at the Radboud University in Nijmegen. On the left the traditional reed-filter, and on the right the biocascade with (from the front to the back: iron coated sand filter, Myriophyllum compartment and the Iris compartment.

Research will be conducted in mainly in mesocosm set-ups and in the laboratory at the well-facilitated Institute for Water and Wetland Research (IWWR) Dpt. of Aquatic Ecology & Environmental Biology and Dpt. of Microbiology, with optional inclusion of pilot projects within China.

We are looking for a motivated ecologist, biogeochemist or environmental microbiologist (MSc) who is fluent in English and interested in both the fundamental and applied aspects of this project, and has experience in, and affinity with experimental work in the field and laboratory. If you are interested, please send your motivation letter, your cv and your publications (if any) to the email addresses mentioned below.

Contact:

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