SUPERVISOR INFORMATION	
First and Last name	Vera Homem/Nuno Ratola
URL of supervisor webpage	https://lepabe.fe.up.pt/v_homem.html https://lepabe.fe.up.pt/n_ratola.html
Department	Department of Chemical and Biological Engineering (DEQB)
Field(s) of research	Environmental Chemistry; Waste Valorisation
PROJECT PROPOSAL	
Title (optional)	Be Water, Again

Brief project description

The challenges to handle wastewater can only be matched by its potential for valorisation. Wastewater treatment plants (WWTPs) are the pivotal core of this opportunity, functioning not only as infrastructure for reception and treatment, but also as hubs for resource recovery and transformation. This project embraces two main pillars of the WWTP operation, driven by the aim of upgrading circularity and maximizing environmental and economic benefits: (i) the water line focusing on the safe reuse of the treated effluent for crop irrigation; (ii) the sludge line, exploring solutions to enhance biogas quality for energy cogeneration.

For the first aspect, the initial aim will be to carry out a thorough characterisation of the treated wastewater in terms of its physicochemical parameters (pH, conductivity, organic matter), nutrient content, and micropollutant levels (*e.g.*, personal care products, pharmaceuticals, PFAS – selection should be done based on the revision of the Urban Wastewater Treatment Directive). This will involve determining daily, weekly and/or seasonal profiles, identifying potential sources, and evaluating treatment performance. The reclaimed water will be then tested in crop-growing assays (*e.g.*, lettuce, strawberries, radishes) to investigate pollutant uptake and translocation within plant tissues, and to evaluate associated human health risks. The potential accumulation and persistence of these contaminants, and eventually nutrients, in agricultural soils irrigated with reclaimed water will be assessed to allow evaluation of the long-term environmental impact. Complementarily, plant productivity and phenological development will be monitored to understand the potential agronomic implications.

All this is achieved with the help of optimized green analytical protocols that include microextraction and quantification by GC-MS and LC-MS.