



### Concept

The Research Project aims to develop a predictive model to assess the performance of a wastewater treatment plant under varying operational conditions caused by the effects of climate change.

Due to this, and particularly the increase in frequency and intensity of extreme weather events, wastewater treatment plants are increasingly subjected to unusual operational conditions that affect the proper execution of treatment processes.

To address these issues, within the scope of this research project, it is proposed to develop and apply a predictive model of performance based on the use of robustness indices in the entire plant and, especially, on final sedimentation unit of the wastewater treatment plant, which has always been considered the most critical unit of plant.

The application of this predictive model will be crucial in identifying the influence of climate change-related effects on the operational conditions and process efficiencies of the plant.

### Scientific approach

In the literature, robustness indices are typically applied in the context of water treatment plants to quantify their performance ([1], [2], [3]). In this research project, the aim is to adapt these concepts to wastewater treatment plants, specifically focusing on the final sedimentation unit.

The research project will be carried out in some phases:

1. Literature review: this phase will specifically focus on identifying all case studies related to changes on plant's performance due to extreme weather events;
2. Modelling of a new performance index : the second phase will involve defining a new index inspired by those already present in the literature but adapted to the specific functioning of a conventional activated sludge wastewater treatment plant;
3. Calibration and validation of predictive model: once the predictive model has been developed, it will be necessary to calibrate and validate it on pilot and/or real plants so that the results obtained can be interpreted and discussed.

### Research objectives

The objective of the research project is to provide water service managers with a predictive and decision-making tool, such as to allow them to implement appropriate interventions that guarantee the correct functioning of the system in relation to certain disturbing factors that may occur and have repercussions on the performance of a wastewater treatment plant.

[1] Hartshorn et al.(2015) Water and Environment Journal, 29(1), 16–26.

[2] Hurst et al.(2004)Science of the Total Environment, 321(1–3), 219–230.

[3] Upton et al. (2017) Chemical Engineering Journal, 313, 250–260.

