# Sustainable and cost-effective production of drinking water from eutrophic and micro-polluted water using a membrane hybrid process (SUPREMES)

BMBF (https://www.bmbf.de/bmbf/de/forschung/hightech-strategie-2025/foerderung-in-der-forschung/foerderung-in-der-forschung_node) funded project SUPREMES is bilateral scientific cooperation between University Duisburg-Essen, Department of Process Engineering/Water Technology (https://www.uni-due.de/Wassertechnik/) – Project coordinator Prof. Dr. Ing- Stefan Panglisch (Germany) and University of Novi Sad, Faculty of Sciences (Serbia), Department of Chemistry, Biochemistry and Environmental Protection – Task lider Prof. Dr. Ivana Ivančev-Tumbas and Department of Biology and Ecology - Task lider Prof. Dr. Jelica Simeunović (Serbia). Project partner is Essener Cornelsen Umwelttechnologie GmbH.

**Project summary**

It is expected that 66% of the world's population will live in cities by 2050. Increasing urbanization, climate change, and rising pressures on natural waters from human activities will pose new challenges to water supplies worldwide in the coming decades. Examples include algal blooms caused by nutrient emissions to water bodies, heat and drought, or contamination of water bodies with micropollutants due to inadequate wastewater treatment. At the same time, the demand for high-quality water for consumers and industry is increasing.

Subproject: Optimization of the membrane filtration process.

Particularly severe membrane fouling has previously been observed for waters with high algal concentrations. Here, the deposition of dissolved organic matter, on the membrane surface or in the pores, rather than the retention of intact algal cells, is primarily responsible for the decrease in membrane performance. The combination of UF with powdered activated carbon should minimize membrane fouling and thus lead to better membrane filtration processes. So far, the hybrid process of powder activated carbon adsorption and ultrafiltration (PAC-UF) is not considered the most suitable drinking water treatment process when water contaminated with both algae and micropollutants must be used for treatment. Usually, a number of conventional treatment methods are used, including adsorption on activated carbon, which usually has to be produced from fossil material. Replacing conventional technology with the PAC-UF process investigated here, including the production of powdered activated carbon from water treatment sludge, represents an innovative, cost-effective and sustainable solution and thus contributes to the German government's High-Tech Strategy 2025 (development of innovative and marketable products, sustainability, climate protection and energy). The main objective is to provide an optimized membrane hybrid process as an innovative technology for the sustainable and cost-effective production of drinking water from eutrophic and micropolluted water. The main tasks for Serbian partner are:

- Optimization of micropollutant removal such as pharmaceuticals and personal care products by hybrid membrane processes from eutrophic water
- Survey of algal populations present in different Serbian freshwater resources in order to determine the predominantly present algae groups and investigation of the influence of different algal populations on membrane fauling.

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