2024 DOCTORAL INPhINIT FELLOWSHIPS PROGRAMME – INCOMING

AQUAIGNIS - Tackling the impacts of wildfires on water supply reservoirs

Area of Knowledge: LIFE SCIENCES

Group of disciplines: Plant, Animal & Environmental Biology, Physiology, Ecology & Conservation

Research project

Context: Man-made reservoirs are strategic water resources worldwide, providing a high level of multi-functionality, from water supply to ecosystems services for human life. Wildfires can significantly threaten water resources, with catastrophic implications for aquatic ecosystems (water quality impairment and noxious effects on the aquatic biota) and human health, namely through the mobilization of potentially toxic elements (PTE), such as metals. Despite many countries, like Portugal, rely on forested watersheds for water supply, the impacts of post-fire PTE on reservoirs and their implications for ecosystems services and human health, remain unexplored.

Aim: AQUAIGNIS uses a stepwise approach integrating chemical, ecotoxicological and modelling evidence with innovative and cutting-edge specific tools, aimed at delivering knowledge, approaches, tools and methodologies to understand the impacts of post-fire PTE on reservoirs, in order to respond more efficiently to emerging water issues related to extreme events (e.g. wildfires, droughts). We hypothesize that the input and mobilization of PTE on reservoirs represents a risk to water quality, ecosystem functioning and human health, either due to post-fire runoff from burnt areas or sediment remobilization over time.

Research team: It relies on a dynamic interdisciplinary team from the CESAM's (University of Aveiro) "Social-Ecological Systems Analysis, Management & Planning research group (SES RG) that cover different scientific areas: chemistry, ecotoxicology and modelling.

Relevance: Aligned with CESAM's mission and strategic objectives, and the UN's sustainable development goals (6, 13 and 5), AQUAIGNIS will provide new knowledge for the conservation, sustainability and management of both forests and water reservoirs affected by wildfires.

Job position description

The job combines field, laboratory and modelling work involving water/sediment/aquatic biota sampling, monitoring, analytical determination, ecotoxicological assays and ecotoxicological modelling. The study area takes place in two major Portuguese reservoirs (Castelo de Bode and Cabril reservoirs; supplying water to 3.5 million people) that have been recurrently affected by mega fires (2003, 2005, 2017, 2019, 2022), as they are located within fire-prone catchments.

The candidate will be responsible for the following five interconnect tasks (T1-5):

T1 – Chemical characterization of distinct compartments (water, sediments and aquatic biota) with respect to metals, to provide information on the fate and mobilization of these PTE on water supply reservoirs.

T2 – Performance of ecotoxicological assays to evaluate the effects of post-fire PTE on key aquatic species representing different functional and biological organization levels.

T3 – Investigate the underlying toxicity mechanisms at sub-individual level, using high-tier molecular biochemical, genotoxicity and cellular biomarkers.

T4 – Development of ecotoxicological models, based on the Dynamic Energy Budget (DEB) theory, to predict the short- to long-term effects of PTEs on aquatic species from different trophic levels.

T5 – Risk assessment of post-fire PTE for the aquatic ecosystem and human health using a Weight-of-Evidence approach.

The candidate will also be in charge of project dissemination, including the publication of scientific papers and presentation of communications at international conferences, having also the opportunity to attend training workshops.

The candidate will work at the Centre for Environment and Marine Studies (CESAM), University of Aveiro, under the supervision of CESAM researchers Isabel Campos, Ana Ré and Dalila Serpa. CESAM has facilities and laboratories with cutting-edge equipment, providing all the support and required conditions to achieve the project goals.

Supervisor team

Dr. Isabel Maria Alves Natividade Campos; Dr. Ana Paula Mónica Simões Ré; Dr. Dalila do Rosário Encarnação Serpa

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Research Group description

The CESAM's research group "**Social-Ecological Systems Analysis, Management & Planning"** (SES RG) integrates environmental, socio-economic and policy sciences, contributing to three CESAM's Thematic Lines: Environment & Health, Integrated Environmental Systems and Marine Ecosystems & Resources. One of the main research topics of the SES RG research is the environmental assessment studies underpinning for decision-making on sustainable land and surface water resources management, focusing on the assessment, prediction, mitigation and demonstration to key stakeholders. Special attention is given to the surface processes driven by climate change, with particular focus on post-fire impacts on soil, resulting contamination to downstream aquatic habitats and the eco-toxicological effects on aquatic organisms.

Additional information

Website of CESAM: www.cesam-la.pt

Website description: The **Centre for Environment and Marine Studies (CESAM)** is a Research Unit created in 2005 and hosted at the University of Aveiro. Its mission is to develop leading international Research and Advanced Training in environmental and marine sciences. Its main objective is to promote a more efficient use of terrestrial and aquatic (from catchment to the deep sea) environmental resources and a more competitive, resilient and sustainable economy. CESAM develops its research along four thematic Lines: Ecology & Functional Biodiversity; Environment & Health; Integrated Environmental Systems; and Marine

Ecosystems & Resources. CESAM's interconnected Thematic Lines are operationalized through twelve interlinked Research Groups (RG). CESAM has a fully equipped facilities and state-of-art equipment for addressing multidisciplinary research on ecology/functional biodiversity, sustainable natural resource management, ecosystem services, climate change adaptation/mitigation, environmental risk assessment, and public health. CESAM team integrate ca 500 members (researchers, PhD students, MSc students and collaborators) offering huge opportunities for collaboration through projects, networks or scientific supervision. Therefore, CESAM stands out due to its transdisciplinary research character and the promotion of international collaboration.

Website of the University of Aveiro, Portugal: https://www.ua.pt/en/