TERRA-MED PhD PROGRAM - Marie Skłodowska-Curie Actions

Context on the program

TERRA-MED is an interregional doctoral program funded under the Marie Skłodowska-Curie COFUND Actions that will recruit and train a new generation of researchers to address the sustainability and resource stress (Water–Land–Energy nexus) in Mediterranean territories.



The Euroregion Pyrenees–Mediterranean, coordinator of the program, brings together the Regions of Occitanie (France), Catalonia and the Balearic Islands (Spain) forming a cross-border research ecosystem. Through this collaboration, TERRA-MED connects world-class universities, research centres and socio-economic actors committed to advancing resilience in the face of climate change. With more than 22,000 scientists across 10 universities and 2 research centers, encompassing 1000 research units, TERRA-MED provides a rich, interdisciplinary environment where doctoral candidates can excel and launch their research careers.

33 PhD positions will be offered to early-stage researchers with a unique interregional, interdisciplinary and intersectoral environment.

Fellows will benefit from having two supervisors (a principal supervisor and a co-supervisor) from two different regions and having a non-academic mentor. The fellows will undertake mandatory cross-border or international stays to the co-institution, as well as a secondment in a non-academic entity.
Moreover, doctoral candidates will receive a specifically designed training program related to their research topics, alongside modules on innovation, entrepreneurship, project management, ethics, open science, etc.

Benefits of TERRA-MED PhD program

- Top-tier PhD education and research training
- Access to world-class laboratories
- Interregional Dual supervision
- Dual PhD degree (France / Spain) where applicable
- Interdisciplinary and cross-sector research experience
- Unique TERRA-MED's excellence training program on resources stress and climate change. See here
- Attractive salary in the frame of MSCA standards
- Extensive network of academic and non-academic partners
- 2 secondments: 1 in the co-supervisor's institution (9 to 12 months); 1 in a non-academic organization to gain extra academic experience and skills (3 to 6 months)

Reference of the thesis project: **UVIC-UCC2**	**Title of the thesis project** ***Combined nature-based and technological solutions to enhance treated wastewater quality under the current EU legislative framework***

Host institution: Universitat de Vic – Universitat Central de Catalunya UVic-UCC FuturLab - Can Baumann	**Co-supervision / co-host institution:** Institut National Universitaire Champollion - INUC
Country Spain	**Country** France
Host Research Unit: *Applied Ecology and Global Change and Environmental Technologies at BETA Technological Centre.*	**Co-host Research Unit:** *Plasma Diagnostics Laboratory (DPHE)*
Name of the first co-supervisor Dr. Lorenzo Proia (Head of the Applied Ecology and Global Change department at BETA TC) Email contact: *lorenzo.proia@uvic.cat* ORCID: 0000-0002-7212-7698 Dr. Alexandre Galí (Head of the Environmental Technologies department at BETA TC) Email contact: *alexandre.gali@uvic.cat*	**Name of the second co-supervisor** Pr. Philippe Guillot (Head of the Plasma Diagnostics Laboratory) Email contact: *philippe.guillot@univ-jfc.fr* ORCID: 0000-0001-5197-4735 Dr. Cristina Muja (Head of microbiology unit of the Plasma Diagnostics Laboratory) Email contact: *cristina.muja@univ-jfc.fr* ORCID: 0000-0001-8302-0653
Doctoral School: Doctoral School of UVic-UCC – PhD Programme in Experimental Sciences and Technology	**Doctoral School:** Doctoral school of Electrical Engineering, Electronics, Telecommunications & Health

Research field(s)

PE8_3 Environmental engineering; LS9_1 Environmental biotechnology; PE10_4 Hydrology and water resources; SH7_6 Environmental policy and sustainability assessment; LS6_9 Antimicrobials and antimicrobial resistance

Keywords

Nature-based solutions; tertiary treatment; sand filtration; activated carbon; cold plasma-based technology; contaminants of emerging concern; EU Urban Wastewater Treatment Directive; wastewater reuse; hybrid treatment systems; Mediterranean rivers

Description of the research project

Context and Rationale

Europe is entering a new era of wastewater management. The revised EU Urban Wastewater Treatment Directive (2024/3019) and the Water Reuse Regulation (EU 2020/741) are raising the ambition for wastewater treatment, calling for improved removal of contaminants of emerging concern (CECs) which includes pharmaceuticals, pesticides and personal care products and higher microbiological safety. This challenge is particularly urgent in water-scarce Mediterranean basins, where treated wastewater is increasingly seen not as waste, but as a valuable resource.

Yet, current treatment approaches face a **critical trade-off between performance, cost and sustainability**. Conventional secondary treatment leaves many CECs behind, while fully technological quaternary solutions such as ozonation or activated carbon can be too costly and energy-intensive for small and medium WWTPs. A promising alternative lies in hybrid treatment trains, combining nature-based solutions (constructed wetlands, sand/soil-aquifer filtration) with targeted technological polishing. However, their capacity to simultaneously remove pollutants, pathogens and antimicrobial resistance (AMR) under the highly variable hydrological conditions of Mediterranean regions remains largely unexplored.

This research opportunity sits at the heart of the Water-Land-Energy nexus. By intelligently **combining the strengths of nature-based and technological solutions**, hybrid treatment systems could deliver safer water reuse while reducing energy demand and limiting land requirements. Beyond regulatory compliance, this approach can contribute to climate adaptation, resource recovery and more resilient water governance, offering an exciting opportunity to **develop the next generation of sustainable wastewater treatment solutions** for the Mediterranean.

Objectives:

O1. Characterise the removal efficiency of CECs, pathogens and AMR indicators across combined NBS + technological treatment configurations.
O2. Demonstrate a hybrid tertiary treatment train (e.g. pond-river sytem/sand filtration + activated carbon) adapted to Mediterranean WWTP contexts.
O3. Assess chemical and effect-based risks of effluents before and after hybrid treatment.
O4. Evaluate the technical feasibility and governance implications of upscaling combined solutions under the revised EU UWWTD and Water Reuse Regulation.

Expected Results:

Validated hybrid NBS-technological configuration(s) with quantified CEC, pathogen and AMR removal performance; an effect-based risk-assessment protocol for treated effluents;

recommendations for water utilities and policy-makers on cost-effective compliance pathways; peer-reviewed publications and stakeholder-oriented guidelines.

Work plan:
M01-M06: **Task 1** - State of the art and site characterization.
M06-M08: **Task 2** - Secondment activities at the co-host institution to identify a potential plasma-based complementary process.
M08-M20: **Task 3** - Testing of NBS-technological combinations.
M20-M30: **Task 4** - Field validation and monitoring (chemical, biological and AMR) at demonstration site(s).
M24-M32: **Task 5** - Risk assessment and governance analysis. Secondment activities at the co-host institution to integrate complementary methods and data.
M30-M36: Synthesis, dissemination and thesis writing.

Please note that this work plan may be subject to slight variations depending on the project's needs.

References of both supervisors:

UVic-UCC / CT BETA — Dr. Lorenzo Proia & Dr. Alexandre Galí:

Bertrans-Tubau, L., Martínez-Campos, S., López-Doval, J. C., Abril, M., Pladelasala-Rocafiguera, G., Ponsá, S., ... & **Proia, L.**, 2025. Improving small urban wastewater treatment plants with a nature-based reactor for tertiary treatment. *Journal of Environmental Management, 393, 126983*.

Bertrans-Tubau, L., Martínez-Campos, S., Lopez-Doval, J., Abril, M., Ponsá, S., Salvadó, V., Hidalgo, M., Pico-Tomàs, A., Balcazar, J.L. and **Proia, L.,** 2024. Nature-based bioreactors: Tackling antibiotic resistance in urban wastewater treatment. *Environmental Science and Ecotechnology, 22*, p.100445

Lluís, Bertrans-Tubau, Abril Meritxell, Maestre Alba, Ponsá Sergio, Suñer Ana Cristina, Salvadó Victoria, Hidalgo Manuela, and Proia Lorenzo. "Improving urban wastewaters using natural microbial communities in bench-scale reactors." Bioresource Technology (2026): 135583. DOI: 10.1016/j.biortech.2026.135583

INU Champollion / DPHE— Pr. Philippe Guillot & Dr. Cristina Muja:

Ibtissam Courti, **Cristina Muja**, Thomas Maho, Florent P Sainct and **Philippe Guillot.** Impact of Bacterial Growth Phase on Liquid Decontamination Efficiency Using Atmospheric Pressure Plasma. Volume 11, Issue 4, 2021. DOI: 10.1615/PlasmaMed.2022041486.

Ibtissam Courti, **Cristina Muja**, Thomas Maho, Florent P Sainct and **Philippe Guillot.** Degradation of Bacterial Antibiotic Resistance Genes during Exposure to Non-Thermal

Atmospheric Pressure Plasma. Antibiotics (Basel). 2022 May 31;11(6):747. doi: 10.3390/antibiotics11060747. PMID: 35740152; PMCID: PMC9219888.

Maria Saba, **Cristina Muja**, **Philippe Guillot** and Thomas Maho. Characterization of a Plasma Source for Water Treatment Using Electrical, Optical, and Chemical Diagnostics. Open Plasma Science. ICPIG 2025. 10.46298/ops.17125.

Required Skills and Competences:

Background in environmental science/engineering, chemistry or biology; interest in ecotoxicology, analytical chemistry and/or environmental microbiology; field and laboratory experimental skills; basic data analysis (R or Python) valued; good written and spoken English (B2 minimum); autonomy and motivation for interdisciplinary, cross-border research.

Master's degree(s) required or equivalent(s):
Master's degree in Environmental Science/Engineering, Environmental Technology, Water Science, Chemistry, (Eco)toxicology, Biotechnology, or a closely related field.

Co-supervision partnership framework

Co-supervision (2 supervisors): Yes

Dual degree PhD (France / Spain) where applicable and approved by the relevant institutions : Yes

Indicative mobility arrangements:
Hosting institution: 25-26 months at UVIC-UCC
Co-hosting institution secondment: 9 to 10 months at INU CHAMPOLLION
Non-Academic secondment: 3 months, partner to be determined

Work conditions
Duration: 36 months
Indicative start date : September/ October 2027

Indicative gross salary:
~ €2,450/month + Statutory end-of-contract compensation in accordance with Spanish legislation estimated at ~ €80/months accrued during the contract and paid at the end of the contract. Estimated total annual gross salary: 30.600€
Eligible fellows with one or more dependent children may receive an additional family allowance of €50 per month.

Training:
Ethical Requirements for the Doctoral Thesis and Professional Activity
Open Science Course of the Catalan Universities
Tools for incorporating a gender perspective into your doctoral thesis
How to present the Research and Training Plan

Mobility required : yes
Non-academic secondment : yes
Dual degree / Cotutelle possible : yes
Doctoral tuition fees and Visa fees: fully covered by TERRA-MED program
Social security: Full employer contributions covered by the recruiting entity.

Host institution	Co-host institution
The Universitat de Vic – Universitat Central de Catalunya (UVic-UCC), owned by the Fundació Universitària Balmes, was officially recognised in 1997 and offers around 42 bachelor's degrees, 18 master's degrees and 10 doctoral programmes. With 25 recognised research groups and 6 research and knowledge-transfer centres, UVic-UCC combines a strong research focus with an international outlook. For PhD students and researchers, its close and multidisciplinary environment offers opportunities for collaboration with established research groups, participation in European and international projects, mobility and networking. Its BETA Technological Center, internationally recognised in environmental technologies, and circular bioeconomy, with pilot-scale facilities and strong links to Catalan industry and agriculture. The candidate will benefit from applied R&D infrastructure, an entrepreneurial environment, and life in Catalonia within the Pyrenees–Mediterranean Euroregion. further provide opportunities for applied research, collaboration with companies and public-	**INU Champollion** is member of Toulouse University. This multidisciplinary institution offers 17 bachelor's degrees, 10 professional bachelor's degrees, and 7 master's degrees, and contributes notably to 5 doctoral schools of the Toulouse University. The research activities fall within 4 major scientific areas: Health and Environments / Digital Technology and Society / Organizations and Change / Heritage and Territories. This multidisciplinary environment offers numerous opportunities for collaboration, within the university and between national and international laboratories. The research activities of the **Plasma Diagnostics Laboratory (DPHE)** concern the design, implementation, characterization, and optimization of plasma-based decontamination processes for applications related to health, the food industry, and the environment. Its distinctive feature lies notably in the presence of a microbiology unit within the laboratory, which makes it possible to study the effects of plasma on microorganisms. This project, within the Pyrenees-Mediterranean Euroregion, aligns with the DPHE laboratory's and the university's sustainable development orientations. Accordingly, they will contribute to the success of this international partnership project with Catalonia, the University of Vic, and the BETA technological center.

sector stakeholders, and knowledge transfer, while also supporting professional	

Eligibility conditions

***Horizon Europe MSCA Mobility Rule*:** Researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of the host organization (France or Spain depending on the employing institution) for more than 12 months in the 36 months immediately before the recruitment date – unless as part of a compulsory national service or a procedure for obtaining refugee status under the Geneva Convention.

***Horizon Europe MSCA Eligibility Criteria*:** Applicants must be eligible for enrolment in a doctoral programme at the employer institution and must not already hold a doctoral degree at the date of recruitment.

Applicants who do not fulfill the Mobility Rule and the Eligibility Criteria WILL NOT be considered for the research position.

***Language requirements*:** Applicants must demonstrate sufficient proficiency (B2) in English to successfully conduct doctoral research and participate in the TERRA-MED training programme.

For more information on this call for candidates see our website here and the guide for applicants here.

APPLY HERE BY Decembre 31st 2026

Administrative Contact

TERRA-MED Programme Office (only for general administrative questions and redress demands. Any research-related question must be addressed to the supervisors by email, see second page)

Email: terramed@euroregio-epm.eu