EU MCSA Doctoral Training Network

August 19, 2025

Call Details and Project Summary

This proposal is for the 2025 call of the Marie Skłodowska-Curie Actions (MSCA) Doctoral Networks (DN): **HORIZON-MSCA-2025-DN-01**. Full details of the call can be found at: `https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2024/wp4-msca-actions_horizon-2024_en.pdf`. The deadline for submission is **25 November 2025, 17:00 Brussels time**.

Project Title and Acronym

MATHPEAT – Mathematical Modelling for Peatland Science and Restoration

Summary and Objectives

Peatlands are critical carbon sinks and hydrological buffers with vast implications for climate change, land use, and ecosystem restoration. This project develops rigorous multiscale mathematical and numerical models to capture key physical, chemical, and biological processes in peatlands. It aims to inform restoration strategies, support climate policy, and contribute tools applicable to other porous media systems.

Doctoral Network Structure

The network will support **12 to 14 PhD projects**, with approximately 2 PhDs assigned to each work package (WP). Each PhD must include at least **3 months** of secondment at a different institution; we aim to plan **6 months total secondments**, either as one long or two 3-month stays. Secondments will strengthen WP integration and collaboration and will take place within the consortium (beneficiaries or associate partners).

Each WP is led by a beneficiary institution. The WP lead hosts one PhD within their WP and supervises another in a different WP, ensuring strong thematic coherence and project-wide leadership. The University of Nottingham will lead the overall project.

Pending confirmations:

- WP5 (Continuum Mechanics) tentatively assigned to Giulio Sciarra (Nantes)
- WP6 (Numerical Analysis) still require confirmed leads; discussions are ongoing with potential French, German, and Dutch institutions.

1 Work Packages

1. Peat Science: field work, ecology, and data collection – establishing baseline datasets, monitoring restoration projects, GHG emissions, vegetation dynamics. (UHI)

2. Peat Science: pore structure, microscale biogeochemistry, lab tests – characterisation of microstructure, organic matter decomposition, microbial activity, small-scale flow and reactive transport. (Waterloo)

3. Peat Science: hydrology and transport, macroscale heterogeneity – including lateral fluxes, water table fluctuations, preferential paths, and multi-year modelling. (CSIC IDAEA, Spain)

4. Continuum Mechanics – development of poro- and visco-elastic models, large-deformation formulations, interfaces and material heterogeneities. (Giulio Sciarra, Nantes?) or Dormieux (Paris?)

5. Numerical Analysis – discretisation methods (FEM/FVM), efficient solvers, time-integration schemes, and uncertainty quantification. (France/Germany/Netherlands? Essen, W. Boon? Eindhoven?)

6. Mathematical Modelling and integration – formulation of multiscale models, homogenisation, coupling of transport, mechanics and reactivity, integration with experimental data. (Padova)

7. Project Management/coordination – administration, communication, data management, and cross-WP integration. (Nottingham)

2 Associate Partners (non beneficiaries)

- Glasgow (Penta)
- University of Birmingham (Ozge Eyice, Sami Ullah)
- Abertay (Ehsan Jorat)
- Pisa (Heltai, Deal.II) or Politecnico di Milano
- Galway (Giuseppe Zurlo)
- CNR and University of Bari?
- Imperial College London (microCT, Martin Blunt)

3 Summer Schools

Training is a key component of the MATHPEAT Doctoral Network. All ESRs (PhD students) will participate in two interdisciplinary summer schools, combining scientific training with career development and transferable skills.

- **Summer School in Thurso (Scotland)** – focused on peat ecology, field data collection, instrumentation, restoration techniques, and ecological management. Includes field trips and experimental demonstrations.
- **Summer School in Padova (Italy)** – focused on mathematical modelling, multiscale analysis, numerical methods, and software tools relevant to peatland simulation.