

Heavy Metal transport in Urban Soils Pore-Scale Modeling and Stochastic Upscaling Techniques

Department: Department of Civil and Environmental Engineering Location: Dipartimento di Ing. Civile e Ambientale Area: 08 - Civil Engineering and Architecture Academic Discipline: CEAR-01/A - HYDRAULICS Duration of the contract (months): 12 Expected start date of activity: 16 december 2024

Research programme description: The project aims to develop models for flow and transport of heavy metals under saturated and unsaturated conditions. The primary objective is to study the distribution and behavior of heavy metals in the subsurface, focusing on the unsaturated zone to assess the risk of groundwater contamination, while considering environmental variables related to climate change. The research is part of the PNRR project National Center of R&S about Key Enabling Technologies National Biodiversity Future Center- NBFC Spoke 5, D43C22001250001

Starting and implementation of the research programme: The research activity will aim at developing, testing and applying original theoretical and computational approaches to reach the objectives of the research plan. To this end, the activity will require to develop novel coding routines and data analysis tools. Key research points include: (1) modeling heavy metal transport in heterogeneous formations at the pore scale; (2) developing upscaling techniques to transition from pore-scale to laboratory and field scales; (3) validating models against laboratory and field data. The methodologies developed will be integrated into probabilistic risk assessment protocols, providing recommendations for groundwater management in contaminated areas.

Activities that the Temporary Research Fellow will carry out, obligations of the Temporary Research Fellow and conditions: Activities will include: (*a*) developing pore-scale models to interpret the observed behavior of the contaminants; (*b*) designing a workflow for the stochastic calibration of these models; (*c*) interpreting model parameters and outputs using a probabilistic approach, including uncertainty quantification; (*d*) presenting research progress and conducting regular meetings; (*e*) writing scientific articles and project reports.