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INFILTRON package for assessing infiltration & filtration functions of urban soils

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The extension of urban and peri-urban areas and the related artificialization of soils drastically impacts the water cycle as well as biogeochemical cycles. In particular, the sealing of soils with impervious surfaces such as roads increases runoff and decreases concomitant infiltration. At the catchment scale, more significant amounts of stormwater must be collected and managed to prevent from flooding urban areas and mitigate discharge to the environment. Sustainable Urban Drainage Systems (SUDS) were developed to alleviate these problems. These systems allow the restoration of one of the main functions of urban and peri-urban soils, i.e., infiltrating stormwater. They simultaneously reduce the risk of flooding and increase groundwater recharge. Another essential service must be ensured and optimized: the removal of pollutants from infiltrating water by the soil, to avoid the degradation of the quality of the groundwater.

The INFILTRON project aims to design a methodology for the assessment of infiltration and filtration of pollutants by SUDS. The project is a collaboration of many partners, with expertise in soil physics, urban hydrology, nanoparticle engineering, and modeling, to engineer a specific device for the simultaneous monitoring of water infiltration and pollutant filtration. This infiltration device both infiltrates water and injects nanoparticles (NPs) into the soil. It was sized to account for preferential flow, which is known to have a significant impact on infiltration and pollutant transfer. The engineered NPs were designed to be detectable in the ground using ground-penetrating radar (GPR) and to mimic the transfer of nano-pollutants (emerging pollutants,

bacteria, etc.) commonly found in real stormwater. An infiltration-filtration model was developed to interpret the experimental data and to quantify two indicators for the assessment of water infiltration and pollutant filtration. INFILTRON will provide a very interesting toolbox for practitioners and stakeholders for the evaluation of the infiltration and filtration functions of not only SUDS within the framework of stormwater management, but also anthropized soils within the management of urban and peri-urban areas.

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