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Quality restoration of impaired water through artificial recharge using organic substrates

Cristina Valhondo (1,2), Lurdes Martinez (2,3), Jesus Carrera (1,2), and Silvia Diaz-Cruz (2)

(1) Institute of Environmental Assessment and Water Research (IDAEA)- Spanish National Research Council (CSIC), Barcelona, Spain (cvaqam@cid.csic.es), (2) Groundwater Hydrology Group (GHS), Spain, (3) Department of Civil and Environmental Engineering (DECA) of the Universitat Politecnica de Cataluña (UPC), Barcelona, Spain

The reuse of impaired waters has become a required component of water resources management due to the increasing demand of quality water, especially in arid and semiarid regions. Therefore, the development of sustainable, high-efficiency, low cost technologies for water treatment is urgent.
Managed artificial recharge of aquifers (MAR) through infiltration basins is a low-energy and low-cost water recycling technology which allows to improve the recharge water quality and to increase groundwater resources. Wastewater treatment plant's effluents are very often used as a water source for MAR through infiltration basins. Emerging organic contaminats (EOCs) are not completelly removed during conventional treatments. Therefore, to understand the fate and transport of such contaminants during MAR is essential to select the possible location, to design the MAR system and to avoid aquifer contamination.
The objective of this study is to design and test reactive barriers based on organic substrates to prevent leaching of EOCs, pathogens, and nutrients by increasing sorption surfaces and by releasing dissolved organic carbon to the infiltrated water, promoting diverse redox conditions and microbial communities.
Six meso-scale system of artificial recharge were built inside a wastewater treatment plant facilities in order to compare the efectiveness of the reactive barriers and the role of diverse experimental conditions. Each one of the six systems (2.5 x 15 m) emulate an aquifer with an infiltration basin. The recharge areas of five systems were complemented with reactive barriers based on organic substrate. The system containing only sand in the recharge areas was stablished as the reference system.
The dissolved organic matter (DOM) released by the reactive barrier into the infiltrated water was enough to achieve a broad range of redox conditions. Preliminary results show a better performance of the systems operating with the reactive barrier.