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Evaluation of artificial groundwater recharge effects with MIKE-SHE: a case study.

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In many areas where the technical and financial resources are limited, the treatment and disposal of wastewater comprise a problem. With increasing frequency, the wastewater reuse is considered as another alternative for water management alternative. In this way, the wastewater is converted into an added value resource. Treated wastewater infiltration into the soil could be a viable tertiary treatment, especially for small communities where the availability of land is not a problem and the wastewater has not industrial waste contribution and is highly biodegradable.

The Experimental Plant of Carrión de los Céspedes (Seville, Spain) develops non-conventional wastewater treatments for small villages. Currently, a project regarding wastewater reutilization for aquifer recharge through a horizontal permeable reactive barrier and a subsequent soil infiltration is being carried out. One of the aspects to be evaluated within this context is the impact on aquifer. Consequently, the main goal of the present study is to assess the effects on the water flow derived from the future recharge activities by using the MIKE-SHE hydrological code. The unsaturated and saturated zones have been integrated in the model, which requires geological, land use, topography, piezometric head, soil and climate data to build up the model.

The obtained results from the model show that with the annual recharge volume contributed by the experimental plant (3 m3 or 0.19 L/s) there is no effect in the groundwater flow. A volume of 400 m3/year (25 L/s) would be required to yield a variation in the piezometric head and therefore, in the groundwater flow i.e. a volume about 100 times larger than the estimated is necessary. To calibrate the model, simulated piezometric head values have been compared to the measured field data at a number of locations. In the calibration, the percent error had to be lower than 15 % at each location.

Future works concerning groundwater quality and reactive transport modelling should be undertaken in order to get a more accurate impact evaluation of the recharge activities.