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The behaviour and fate of Nitrate and Phosphate present in treated wastewater when discharged to the Chalk aquifer of SE England

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The Chalk aquifer of South East England is a major groundwater resource and regionally supplies up to 70% of all water abstracted for potable purposes. The two main pressures on groundwater resources are considered to be climate change and population growth. As the demand for water increases, so does the volume of wastewater that has to be treated to acceptable levels before being discharged back into the environment.

Aquifer storage and recovery (ASR) is form of groundwater resource management whereby water is pumped or injected into the ground and allowed to percolate through to the saturated zone before being abstracted at a later date. By injecting water into the ground during periods of high precipitation (i.e. winter months) an increased volume of water is made available for later abstraction (i.e. during summer months) helping water resource planners better manage the supply demand balance.

In the case of using treated wastewater as a source for artificial recharge, there is little published research on the behaviour and fate of the main contaminants of concern that are found in treated wastewater when they are discharged to the principal aquifer (the Chalk) of SE England. Nitrate and Phosphate are listed (amongst others) as the main contaminants of concern that are present in treated wastewater and discharged to the Chalk aquifer when this practice occurs.

The CLIMAWAT project is an EU-Regional Development Fund Interreg IV funded research programme to study the impacts of climate change on groundwater resources and groundwater quality from the Chalk aquifer of SE England. The use of treated wastewater for artificial recharge has been extensively studied in both the field and laboratory to better assess how sustainable this practice is in terms of risk of pollution to the groundwater body. The results of the laboratory programme include breakthrough curves for Nitrate and Phosphate in the Chalk matrix under unsaturated and saturated conditions. Whilst Nitrate is shown not to be sorbed in the Chalk matrix, a proportion of the Phosphate is shown to be retained. The proportion of Phosphate that is retained is less than the total retention capacity of the Chalk matrix and the mechanisms that control this are reported.

The laboratory and field data will be compared and geochemical models used to upscale to catchment level. This will allow for a better assessment of the risk of pollution occurring at the groundwater body and how sustainable the use of treated wastewater is as a source for ASR in Chalk catchments to be made.