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The Impact of Climate Change on Aquifer Recharge and Groundwater Quality in the Patcham Catchment, England

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It is widely accepted that we are entering a period of climate change. In the SE of England, more extreme weather patterns, with warmer drier summers and milder wetter winters are expected for the future in this area. Changing precipitation patterns and an increased frequency of extreme weather events (i.e. flooding and droughts) will affect the volume of water available to infiltrate to the groundwater system. This in turn will affect groundwater quality by altering contaminant transport pathways, groundwater chemistry or both. This has significant implications for long term water resource planning, especially in SE of England which is already classed as 'water stressed'.

The CLIMAWAT project is an EU-Regional Development Fund Interreg IV funded research programme to study the risks of climate change and better enhance the management of drinking water supplies dependent on groundwater from the Chalk aquifer of SE England. Project partners include water companies, regulatory bodies and industry consultancies.

The four main objectives of the CLIMAWAT project are: i) to improve the prediction of the impact of climate change on this groundwater resource; ii) better understand the fate of contaminants (e.g. nitrates and pesticides) in a fractured porous aquifer and iii) better understand the storage mechanisms in this aquifer and iv) investigate the impact of artificial recharge using treated wastewater.

An extensive field monitoring and data collection programme will be conducted in the Patcham Catchment (SE of England). Simultaneous monitoring of climatic, unsaturated zone potentiometric, groundwater level and chemistry data over the project duration will allow for changes in rainfall, recharge and groundwater quality and quantity to be interpreted. Aquifer characterisation, geophysical and water dating techniques will enable groundwater recharge flow processes to be investigated. This will lead to a better understanding of flow, dispersion and adsorption of pollutants (nitrates and pesticides) in a fractured porous aquifer. Results from laboratory experiments will compliment the field based studies to further enhance the understanding of contaminant behaviour in the unsaturated and saturated zones. The use of treated wastewater for artificial recharge and the risk associated with this practice will also be investigated in both the laboratory and study catchment.

The outcomes of the field and laboratory based studies will enable and improve the development of larger scale estimates of the impact of climate change on groundwater resources. Uncertainty analysis, risk assessment and groundwater modelling techniques will be developed. These will be of use to both regulatory agencies and stakeholders to assess groundwater vulnerability in relation to climate change, improving best estimates and better informing water resource planners.