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VULNERABILITY OF ESTUARY WATER QUALITY TO CLIMATE CHANGE

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Estuaries are crucial for freshwater and nutrient cycling throughout shelf seas. Being at the interface between oceanographic and fluvial processes, estuaries are the most dynamic coastal system, where water quality processes are shaped by complex geo-physical, chemical, and biological interactions that change over small spatio-temporal scales and are unique to each estuary. It is essential that these systems maintain safe water quality standards and that we are prepared for future changes in water quality that will affect their ecological status and public health risk.

This research aims to characterise variability and potential change in indicators of estuary health across the UK, using a robust analysis and modelling strategy, that can be built upon to evaluate a range of water quality degradation processes and used to inform future management strategies. We will present the first analysis of both riverine and marine climate projections for the 21st Century (UKCP18 RCP8.5 perturbed parameter ensemble), downscaled to hourly- and sub-meso-scales, and applied to all estuaries in England, in particular characterising projected changes in hydrology, temperature, salinity, sea level, and coincident conditions. Additionally, we have developed fine-scale estuary hydrodynamic models (Delft3D) of all estuaries and present potential changes in simulated estuary residence times as a result of projected sea-level rise and changing hydrology. The analyses and simulations highlight estuaries and estuary types that are vulnerable to changes in the physical stressors of coastal water quality and where coastal management efforts and hazard response should be focused in the coming decades.