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Modelling nitrogen and phosphorus fluxes from land to the UK river network - Scenario Analysis and possible mitigation measures

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Nutrient export models, based on land use and land management data, support the analysis of the cause and effect of land use changes and aid in identifying significant nutrient sources. Although various simple approaches such as export coefficient modelling have been used for national scale and regional-scale studies, many of them lack inclusion of process-based elements to the model. In this study, we present a model that describes the river nutrient (nitrogen and phosphorus) load as a function of nutrient sources, runoff, nutrient retention and hydrogeology. The model was calibrated using measured water quality data on N and P at catchment outlets and was applied to a 2-km resolution dataset established for England, Wales & Scotland. A 2-km resolution Digital Elevation Model (DEM) was developed using the grid and a flow accumulation algorithm in ESRI's ArcGIS. We combine nutrient loads from each 2-km cell with the flow accumulation model to identify the spatial distribution of critical nutrient sources to river water. Subsequently, the model was used to analyse different land management and climate change scenarios. The results of this study and scenario analysis seek to identify potential nutrient sensitive areas and support land use planning and policy decisions.