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## Climate Change Impacts on Streamflow in Two Highly Abstracted English Catchments Under a High Emissions Scenario - Implications for Environmental Flow Protection

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## Climate change impacts on streamflow in two English catchments under a high emissions scenario - implications for environmental flow protection

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**Abstract:** The spatio-temporal water availability for environmental flows can be severely affected by climate change. Robust water management approaches are urgently required to alleviate pressure on abstracted freshwater ecosystems. Modelling of the impacts of climate change on streamflow and water availability at the catchment scale has become indispensable in informing decision makers. We use the 12 new Hadley Centre climate model regional projections with a resolution of 12km for a high emissions scenario: Representative Concentration Pathway (RCP) 8.5. With the completely revised Soil and Water Assessment Tool (SWAT+) we simulate natural daily flows until the 2080s in two English catchments. While both catchments are similar in that they are affected by high rates of freshwater abstraction, they differ in their natural hydrological regimes and geographies. One is a wet coastal catchment with steep slopes while the other is a dry lowland catchment. SWAT+ performed well in simulating natural flows during the validation period (from 2009 to 2017) in both catchments. Under RCP 8.5. results show pronounced effects of climate change on future water availability, which we use as a basis to assess alternative environmental flow scenarios and abstraction licensing regimes which could be implemented to alleviate these effects. This study highlights the need for the translation of regional climate change information into locally explicit climate impacts for informed decision making in water management. It furthermore emphasises the urgency for developing and implementing environmental flow protection policies that incorporate climate change while being applicable to a wide range of hydrological regimes.

**Keywords:** Environmental flows; SWAT+; Regional climate projections; RCP 8.5