Towards a resilient water future via inter-basin water transfer: climate impact assessment and feasibility study

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Uneven distribution of water resources in the face of climate change and population growth is imposing increasing threats to communities as well as challenging decision-makers. Inter-basin water transfer (IBT) schemes have been appreciated as one of the common approaches to tackle this issue. This work presents a framework for climate impact assessment and feasibility study for IBTs. The framework investigates negative impacts of IBTs on the donor and receiving bodies. This is done by calculating hydrological drought risk and environmental risks to freshwater habitats under 1200 future climatic scenarios and two different transfer scenarios. 2.2 Km resolution time-series from UK's Met Office most recent climate projection (UKCP18) is used as the input scenario and a water resources model developed at Newcastle University is implemented to determine allocation and calculate the above risk factors. This work considers transferring raw water from England's water-rich North East to its water-stressed South East as the case study. This case was chosen because England, with no major IBT scheme, is experiencing challenges from more frequent climate change and increasing demand for water in London. Additionally, organisations such as National Infrastructure Commission (NIC) and Environment Agency (EA) have encouraged England's water companies to consider IBT as one of the options to improve water supply resilience. In this study, we assess schemes to transfer water using the existing infrastructures of water companies located from North East to South East of England to minimise costs and environmental impacts. Results suggest that, under a wide range of future scenarios, meeting London's annual water shortage through transfers from the North East during wet season of each year not only increases London's water supply resilience but also boosts flood resilience in the North East donor basin while still meeting environmental requirements.