



Drought Libraries: a nationally consistent toolkit for improved resilience in the UK public water supply sector

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Long-term planning of water resources has been a key requirement of the providers of water supplies, and this is extremely important nowadays. There are multiple competing demands on public water supplies due to increasing populations, climate change and the need to protect the environment.

In the UK, public water supply is provided by around 25 water companies. The regulators require water companies to produce management plans on a five-year cycle, ensuring that the companies have given the necessary consideration of how to manage the supply-demand balance at present and future. It has recently been necessary to test water supply systems against the 'worst historical' drought event and consider those 'beyond historical' that might occur in future. However, this event varies by region. There is also no agreed methodology for determining this worst historical event, and each water company may use different datasets to reach an answer. Given this lack of consistency at a national scale, there is considerable interest in rationalising the approach to help answer questions relating to drought affecting multiple neighbouring water companies and around the feasibility of large-scale water transfers.

This need is addressed by the UK Droughts & Water Scarcity Programme, which supports improved decision-making and communication in relation to droughts and water scarcity for a range of sectors. Capitalising on new improved national-scale data for extensive historical and future timeframes, consistently derived 'drought libraries' are developed.

These drought libraries are sets of drought events across a range of durations and severities. They have been produced for a range of spatial domains, facilitating the exploration of questions around the spatial coherence of drought. Due to the extended historic period, the libraries incorporate information about droughts events back to the second half of the 19th century and provide the opportunity to characterise the recent events in their wider historical context. Moreover, the information about possible realisations of the future droughts, with climate model projections up to 2099, can inform stakeholders on the expected severity of future events. These can be used by the water industry for stress testing water supply systems and quantification of the probable future drought hazard.

This study demonstrates the applicability of the drought libraries and utility to the water industry through a number of case study catchments in southern England. Based on the results, the severity of a specific historical drought event varies notably across different rainfall accumulation periods, showing that the reference events should be carefully selected for the various durations. Moreover, the future projections indicate that the drought hazard will be intensified in this part of the UK. Events of a certain severity in historical datasets are expected to increase in frequency in the future.

The application of nationally consistent drought libraries in assessments of resilience to past, present and future droughts will maximise the benefit in managing the UK's national water resources, and begin to address some of the critical questions around how to reconcile the often competing demands from society, economy and environment.