

Real time reservoir control on the River Lee using a forecasting system

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Work will soon begin on a €50m flood alleviation scheme Cork: Ireland's second city. It is the government's largest fluvial flood protection project. Restrictions on wall heights mean flood storage is needed to achieve the required standard in the city of 1 in 100-years. That storage will be created in two hydropower reservoirs on the River Lee, just upstream, on the run-up to an event. Drawdown is triggered by the innovative real time forecasting system described in this paper. Four days prior to the event, reservoirs are lowered from a level optimum for hydropower generation to one that can manage the flood event.

This system is the first in Ireland (or in the British Isles) to attempt real time, 'rule-based', reservoir draw-down for flood alleviation. Although the final decision on drawdown is made by an operator, the system encodes complex control rules and implements them as a scenario. It is capable of independently controlling the draw-down process.

Procedures have been rigorously tested by:

- Running the system with a continuous 1,000-year stochastic rainfall series to establish the design flow; and
- Running the system with actual forecast rainfall, including ensembles, between 2007 and 2016, to confirm the likely false alarm rate.

Both show that the design flow in the Lee through Cork would have been achieved if the system's recommendations were followed. Although drawdown false alerts are commonplace (seven per year), the system's captures water from an event to refill reservoirs with hours or days.

This paper describes the Lee forecasting system, how it controls reservoir levels during floods and its performance record for the synthetic and observed series'. The work has important applications for other catchments where real time control of large storage reservoirs could play a role in flood defence.