

Optimal multi-year operation of a water supply system under uncertainty: robust methods

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Abstract The Robust Optimization (RO) methodology (Ben-Tal *et al.*, 2009) is applied to optimize the operation of a water supply system (WSS) which supplies water from aquifers with uncertain recharge and desalination plants through a network to consumers. The objective is to minimize the total cost of multiyear operation, while satisfying operational and physical constraints. The RO methodology optimizes the uncertain problem by requesting that the uncertain parameters reside within a user-defined uncertainty set. The static (“here and now”) version of RO is called Robust Counterpart (RC), in which the original problem is converted into a deterministic equivalent problem. A generic RC model for optimal operation of a WSS is developed and demonstrated. The policies obtained by the RO methodology, each requiring a different reliability, are compared with other decision making approaches.

Key words water supply systems; optimal operation; uncertain recharge; robust counterpart; robust optimization