Inverse Modelling of a Dynamic Decision Support System for Water Resources Planning and Management

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The sustainability of water resources has become a growing concern on both local and global scales. As populations increase, the availability and accessibility of these resources is reduced due to both higher demand and poor resource management. Careful management is crucial for future availability, however there is often a disconnect between scientists and managers that makes it difficult for scientific knowledge to be used meaningfully in the decision-making process. Management decision support models are potentially useful tools for bridging this gap, particularly in the area of water resources.

We have developed a water supply decision support model for the Palm Beach County Water Utility District (PBCWUD) by combining a hydrologic model with multi-criteria decision analysis (MCDA). This work described an inverse modelling case study to validate the combined hydrologic and decision model against historical data from the Wakodahatchee Wetlands, a project owned and constructed by the PBCWUD. Specific elements evaluated in this case study include water supply and wastewater discharge, and economic and regulatory factors contributing to management decisions. Validation was performed using the Water Evaluation And Planning System (WEAP) hydrologic model and three types of MCDA ranking methods: the Weighted-Average Method, PROMETHEE Method and the Discrete Compromise Programming Method. WEAP was used to simulate the hydrologic effects of each alternative, and the MCDA ranking methods were used to weight and evaluate the combined hydrologic, economic, and regulatory criteria for each alternative project.