



## **The economic value of drought information: Application to water resources management decisions in Spain**

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Information is valuable when it improves decision-making (e.g., actions can be adjusted to better suit the situation at hand) and enables the mitigation of damage. However, quantifying the value of information is often difficult. Here we explore a general approach to understand the economic value of drought information for water managers framing our approach in the precautionary principle that reminds us that uncertainty is not a reason to postpone or avoid action. We explore how decision making can disregard uncertain effects, taking a short-term approach and focusing instead on the certain costs and benefits of taking action. Two main questions arise: How do we know that advanced drought information is actually helping decisions?; and What is the value of information in the decision process?

The approach is applied to several regulated water resources systems in Spain. It first views drought information as a factor in the decision process which can be used by water managers to reduce uncertainty. Second, the value of drought information is the expected gain in a decision outcome (utility) from using additional information. Finally, the gains of improved information are compared with the information collection costs. Here we estimate the value by taking into account the accuracy of the drought information, the subjective probabilities about the value, analyzed as Bayesian probabilities, and the ability or skill of the stakeholders to apply the drought information to modify their actions. Since information may be considered a public good (non-rivalry and non-excludability), it may justify public policy in the provision of information, considering social costs and benefits.

The application of the framework to the Spanish case studies shows that information benefits exceeds to costs when drought frequency is 20-40% above normal values; below these values uncertainty in the decisions dominate the results; above these values, the management decisions are limited even with perfect information.