

## **Insights into water managers' perception and handling of uncertainties – a study of the role of uncertainty in practitioners' planning and decision-making**

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Planning and decision-making under uncertainty is common in water management due to climate variability, simplified models, societal developments, planning restrictions just to name a few. Dealing with uncertainty can be approached from two sites, hereby affecting the process and form of communication: Either improve the knowledge base by reducing uncertainties or apply risk-based approaches to acknowledge uncertainties throughout the management process. Current understanding is that science more strongly focusses on the former approach, while policy and practice are more actively applying a risk-based approach to handle incomplete and/or ambiguous information.

The focus of this study is on how water managers perceive and handle uncertainties at the knowledge/decision interface in their daily planning and decision-making routines. How they evaluate the role of uncertainties for their decisions and how they integrate this information into the decision-making process. Expert interviews and questionnaires among practitioners and scientists provided an insight into their perspectives on uncertainty handling allowing a comparison of diverse strategies between science and practice as well as between different types of practitioners.

Our results confirmed the practitioners' bottom up approach from potential measures upwards instead of impact assessment downwards common in science-based approaches. This science-practice gap may hinder effective uncertainty integration and acknowledgement in final decisions. Additionally, the implementation of an adaptive and flexible management approach acknowledging uncertainties is often stalled by rigid regulations favouring a predict-and-control attitude. However, the study showed that practitioners' level of uncertainty recognition varies with respect to his or her affiliation to type of employer and business unit, hence, affecting the degree of the science-practice-gap with respect to uncertainty recognition. The level of working experience was examined as a cross-cutting property of science and practice with increasing levels of uncertainty awareness and integration among more experienced researchers and practitioners.

In conclusion, our study of water managers' perception and handling of uncertainties provides valuable insights for finding routines for uncertainty communication and integration into planning and decision-making processes by acknowledging the divers perceptions among producers, users and receivers of uncertainty information. These results can contribute to more effective integration of hydrological forecast and improved decisions.