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Who to Blame: Irrational Decision-Makers or Stupid Modelers? (Arne Richter Award for Outstanding Young Scientists Lecture)

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Water management benefits from a suite of modelling tools and techniques that help simplifying and understanding the complexities involved in managing water resource systems. Early water management models were mainly concerned with optimizing a single objective, related to the design, operations or management of water resource systems (e.g. economic cost, hydroelectricity production, reliability of water deliveries). Significant improvements in methodologies, computational capacity, and data availability over the last decades have resulted in developing more complex water management models that can now incorporate multiple objectives, various uncertainties, and big data. These models provide an improved understanding of complex water resource systems and provide opportunities for making positive impacts. Nevertheless, there remains an alarming mismatch between the optimal solutions developed by these models and the decisions made by managers and stakeholders of water resource systems.

Modelers continue to consider decision makers as irrational agents who fail to implement the optimal solutions developed by sophisticated and mathematically rigours water management models. On the other hand, decision makers and stakeholders accuse modelers of being idealist, lacking a perfect understanding of reality, and developing 'smart' solutions that are not practical (stable).

In this talk I will have a closer look at the mismatch between the optimality and stability of solutions and argue that conventional water resources management models suffer inherently from a full-cooperation assumption. According to this assumption, water resources management decisions are based on group rationality where in practice decisions are often based on individual rationality, making the group's optimal solution unstable for individually rational decision makers. I discuss how game theory can be used as an appropriate framework for addressing the irrational "rationality assumption" of water resources management models and for better capturing the social aspects of decision making in water management systems with multiple stakeholders.