

Communicating infrastructure related trade-offs under uncertain conditions in complex socio-environmental systems

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As a result of population and economic growth, many river basins are under increasing pressure to provide multiple water-related benefits whilst maintaining ecosystem services. Historically, engineered interventions were selected through analysis of the least-cost option for meeting projected demands. Impacts on non-market water users and ecosystems and trade-offs between different interests are challenging to represent in this analysis leading to conflicts between water using regions or sectors, and lack of transparency and clarity in why certain projects go forward. A range of proposed assets often exists but approaches to systematically assess what combinations of investments could be strategic, particularly given future uncertainties such as climate change and demand growth, are lacking in many cases. We report on recent work in the UK, Kenya and Ghana which uses high performance computing and many-objective trade-off analysis to support such systematic assessment. The approach produces complex results, dense with information, which need to be effectively communicated to diverse stakeholders if they are to be the basis of consensual decision-making as intended.

To address this challenge we have carried out stakeholder group exercises to explore the advantages and disadvantages of two different methods of communicating these results - parallel coordinate and trade-off scatter plots. Our goal was to grasp how quickly groups understood information provided in different formats and how to make best use of them in multi-organisation deliberative sessions. We used various interactive plot features such as brushing (filtering) to remove options deemed unacceptable by one or more parties. We report observations, early thoughts on best practices, and future lines of investigation in the use of visual analytics for deliberating infrastructure interventions in complex socio-environmental systems.