An overview of models for decision making in environmental sustainability [Poster]

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Environmental sustainability is a key concern, affecting the future wellbeing of humankind. It is widely acknowledged that increasing connectivity and dynamic interactions among complex large-scale systems, (ecosystems, economic- and social systems) pose a risk to sustainable future. Much effort is spent on modelling the environment to assess scientific hypotheses, explain system behaviours in response to changes in system properties, and to predict the future state of a system. These models enhance the understanding of environmental systems at various levels of detail and support decision making for management and control. To construct predictive models, we need a theory (with predictive ability) and specific information for model parameters. We survey fundamental mathematical models, classify ecological models, and discuss their strengths and weaknesses. The aim is to be able to recommend the most suitable model-type for the job according to the concerns and issues identified by stakeholders. In the next step, the study categorises the types of problems that are faced in the short-term (operational and tactical level) and long-term (strategic level) management for sustainability. We discuss the need for, and relationship between, future 'design models' and (the mostly parametric) models of 'current systems'. The aim of parametric models is to keep system performance indicators within acceptable limits, by predicting how to manipulate control parameters ('decision variables') to obtain desirable system outputs. However, this might only satisfy the current and near future survival of systems, and long-term sustainability might not be possible based on only manipulating current parameters. The problem reveals the need for new types of theories and models, where the predictive capability of the models can be calibrated and validated in the vicinity of desired spatio-temporal trajectories, the viability of the system can extrapolated, and options for structural (architectural) changes can be explored for strategic level decision-making.