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Validation of uncertainty-oriented environmental models: A review of the existing approaches

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Environmental modelling is a commonly used tool to assist the policy dimension of sustainability problems. Model evaluation is an important process in such decision-making contexts to ensure credibility, and it is often considered a purpose-dependent activity. Models are increasingly used for the purpose of scenario generation to deal with non-probabilistic uncertainties. This change in the model purpose implies a change in the evaluation process, and may require different validation techniques.

In this paper, we investigate the existing validation viewpoints and approaches, and compare the general modeling context to the scenario generation purpose in particular. We employ three methods for this investigation: (i) A literature review about validation in environmental modeling, (ii) a text-mining analysis on a large dataset of validation-related publications, and (iii) an online survey conducted among model developers and users in academia, governmental and non-governmental policy organizations, and industry. The results indicate a data-orientation for systematic validation, and that conventional validation approaches are adopted even for models used for the purpose of scenario exploration. Future studies can develop a validation framework for models used specifically for generating scenarios and decision-making under non-probabilistic uncertainty.