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How robust is a robust policy? A comparative analysis of alternative robustness metrics for supporting robust decision analysis.

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In response to climate and socio-economic change, in various policy domains there is increasingly a call for robust plans or policies. That is, plans or policies that performs well in a very large range of plausible futures. In the literature, a wide range of alternative robustness metrics can be found. The relative merit of these alternative conceptualizations of robustness has, however, received less attention. Evidently, different robustness metrics can result in different plans or policies being adopted.

This paper investigates the consequences of several robustness metrics on decision making, illustrated here by the design of a flood risk management plan. A fictitious case, inspired by a river reach in the Netherlands is used. The performance of this system in terms of casualties, damages, and costs for flood and damage mitigation actions is explored using a time horizon of 100 years, and accounting for uncertainties pertaining to climate change and land use change. A set of candidate policy options is specified up front. This set of options includes dike raising, dike strengthening, creating more space for the river, and flood proof building and evacuation options. The overarching aim is to design an effective flood risk mitigation strategy that is designed from the outset to be adapted over time in response to how the future actually unfolds. To this end, the plan will be based on the dynamic adaptive policy pathway approach (Haasnoot, Kwakkel et al. 2013) being used in the Dutch Delta Program. The policy problem is formulated as a multi-objective robust optimization problem (Kwakkel, Haasnoot et al. 2014).

We solve the multi-objective robust optimization problem using several alternative robustness metrics, including both satisficing robustness metrics and regret based robustness metrics. Satisficing robustness metrics focus on the performance of candidate plans across a large ensemble of plausible futures. Regret based robustness metrics compare the performance of a candidate plan with the performance of other candidate plans across a large ensemble of plausible futures.

Initial results suggest that the simplest satisficing metric, inspired by the signal to noise ratio, results in very risk averse solutions. Other satisficing metrics, which handle the average performance and the dispersion around the average separately, provide substantial additional insights into the trade off between the average performance, and the dispersion around this average. In contrast, the regret-based metrics enhance insight into the relative merits of candidate plans, while being less clear on the average performance or the dispersion around this performance. These results suggest that it is beneficial to use multiple robustness metrics when doing a robust decision analysis study.

Haasnoot, M., J. H. Kwakkel, W. E. Walker and J. Ter Maat (2013). "Dynamic Adaptive Policy Pathways: A New Method for Crafting Robust Decisions for a Deeply Uncertain World." Global Environmental Change 23(2): 485-498.
Kwakkel, J. H., M. Haasnoot and W. E. Walker (2014). "Developing Dynamic Adaptive Policy Pathways: A computer-assisted approach for developing adaptive strategies for a deeply uncertain world." Climatic Change.