

Thomas van der Pol, Jochen Hinkel, Jan Merkens, Leigh MacPherson, Athanasios T. Vafeidis, Arne Arnse, Sönke Dangendorff, 2021, Regional economic analysis of flood defence heights at the German Baltic Sea coast: A multi-method cost-benefit approach for flood prevention, February 2021, *Climate Risk Management*, 32(04016028): 100289, DOI: 10.1016/j.crm.2021.100289

**Abstract** Mean and extreme sea-level uncertainties, as well as uncertainty about future flood exposure, hinder the risk-based optimisation of flood protection investments. To deal with these uncertainties, cost-benefit analysis (CBA) and methods for robust decision-making can be combined. This paper sequentially applies CBA, robust optimisation methods and info-gap analysis to find efficient and robust coastal flood protection strategies for the German Baltic Sea coast. The CBA results suggest that – under flood risk assumptions – a share of the coast of Schleswig-Holstein (9.3–10.1%; 60–65 km) and Mecklenburg-Vorpommern (4.1–10.0%; 78–189 km) with relatively high flood exposure, might currently be under-protected from a social welfare perspective. Present Value estimates of regional investment costs of five regret or loss minimising strategies range from 1.7 to 4.8 billion Euro across robustness metrics at 3% discounting. The info-gap analysis suggests that some of these strategies will fail to prevent large-scale damages under high-end scenarios. We conclude that a multi-method cost-benefit approach can be used to narrow down the number of solutions that are both potentially efficient and sufficiently robust by investigating strategy performance within, across and beyond predefined scenarios.

**Keywords** Climate change adaptation, Cost-benefit analysis, Flood protection, Robust decision-making, Info-gap, Regret