

Maria Mavrova-Guirguinova, Julieta Mancheva and Denislava Pencheva, 2023, Decision analysis for robust long-term flood management: Uncertainty exploration using probabilistic approach and information-gap decision theory, *International Journal of Design and Nature and Ecodynamics*, Vol.18, Issue 1, Pages 117–124, February 2023.

Abstract Decision making for flood risk management involves comparing options based on their benefits and costs. These choices always involve considerable uncertainties, especially when long-term projections are being developed, taking climate change into account. The aim of the study is to reveal what is the uncertainty robustness of alternative flood defense measures. The treatment of different sources of uncertainty is carried out by using probabilistic analysis of net present value (NPV) as well as using information gap decision theory (IGDT). The focal point of the study is a settlement in Nord Bulgaria with a record of severe flooding in the past, for which divergent climate change projections have been generated under the RCP 4.5 and RCP 8.5 scenarios. The behavior of three civil defense options under these uncertainty conditions is explored over an extended 30-year time horizon up to 2050. The paper shows sequentially Probabilistic Performance Analysis with NPV performance criteria, and then how Information-Gap Decision Theory can be formulated and used to analyze same options. After discussing the results, we conclude that facing deep uncertainty in long-term flood protection decision making, it is advisable to use multiple methods that differ in data and assumptions, necessarily taking into account hydrological uncertainty from climate change, that could dramatically change our choices.

Keywords climate change; flood risk management; Info-Gap Decision Theory; probabilistic performance analysis; uncertainty.