



BN-FLEMOps - A probabilistic multi-variable flood loss model for Europe

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With globally increasing flood losses reliable flood risk assessments on the continental scale are needed to facilitate efficient management and adaptation policies. Flood loss estimation is an integral component for the implementation of the EU Floods Directive and an indispensable tool for the insurance and re-insurance industry to calculate premiums and define solvency requirements.

Flood loss models often rely on simplified water-depth to damage relations and usually neglect other flood intensity metrics and parameters describing resistance characteristics. These models rarely report uncertainties associated with flood loss estimations. To reduce these deficiencies, we present the novel, probabilistic, multi-variable Bayesian Network Flood Loss Estimation MOdel for the private sector BN-FLEMOps. The model allows for the consideration of multiple predictor variables and the quantification of uncertainties in loss estimates. BN-FLEMOps is applicable on the meso- and micro-scale for residential buildings in the whole of Europe and can be adapted to regional situations via an updating approach. A validation in three European case studies (Italy, Austria and Germany) shows that the officially reported loss figures of past flood events are within the 2.5% - 97.5% quantile range of the probabilistic loss estimates. BN-FLEMOps performs well in a comparison with several established flood loss models for the flood event of 2002 in the German Mulde catchment. BN-FLEMOps has been implemented in the OASIS Loss Modeling Framework and data sets for European wide flood loss estimation will be made available on the online platform OASIS Hub to facilitate the model application by practitioners and researchers.