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Assessing the indirect economic effects for entrepreneural flood risk management based on extreme precipitation scenarios and LiDAR-data

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Indirect economic losses triggered by natural hazards are widely underestimated by corporate managements. They can exceed direct damages in the case of flood events and are difficult to evaluate due to missing data on a micro scale. Existent data (e.g. gross-regional-product on NUTS-level, affected employees, business sector) can be used for meso analysis, but are of little relevance neither for mitigation policies nor for cost-efficient technical mitigation measures for single flood prone companies. Moreover, stock- and flow-measurement of indirect effects are mostly mixed up and trigger double-counting, afflicting in results with high uncertainty. The study represents a multidisciplinary collaboration for the risk assessment of possible runoff scenarios for flood prone and globalized production companies with high regional economic impact. The main focus lies on indirect effects, business interruption and direct flood damages as input parameters for cost-efficiency evaluations. The main objective for the assessment of indirect effects is nesting these results into cost-benefit-analyses (CBA) as an essential component for entrepreneurial risk management strategy in the case of floods. In Austria′s natural hazard management, CBA for mitigation measures is regulated by law and compulsory above certain level of expenses, but shows its limitations amongst others in the assessment of indirect economic effects. At this point we argue that only single observations and the analysis of production structures as well as input/output flows of commodities of the affected company are the fundament for evaluating indirect economic effects. In this study a corporation between natural science and economics is presented in the context of a multidisciplinary risk assessment approach. In the presented workflow, recorded precipitation rates are analysed to find extremes, which are statistically related to discharge volumes. A two-dimensional hydrodynamic model is created, which bases on a high-resolution digital terrain model (DTM) and a roughness coefficient map, both calculated from airborne laser scanning (ALS) data. The results of the two-dimensional hydrodynamic model are used to identify possible inundated areas and buildings as well as the water depth. The modelling results are used for calculating three different flood mitigation scenarios: a) no structural mitigation, b) mobile measures and c) full technical mitigation to prevent even losses triggered by a 300-years return period flood. The conducted CBA will identify the most cost efficient mitigation strategy.