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Vulnerability Calculation for Residential Areas

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Up to now vulnerability assessment in terms of economic damage potentials was merely based on damage functions built up on expert knowledge and experience from the last decades. In the perspective of a time horizon of 2050, especially for residential building structures, completely new damage functions are needed based on cause-effect relationships and refurbishment costs.

The research on potential damages for residential areas is embedded in the VERIS-Elbe research project funded by the German Ministry for Education and Research (BMBF). Within VERIS-Elbe a new model tool with a high spatially resolution for the dynamic simulation of damage expectancy values for the next 50 years is in development.

Within VERIS the simulation model (HOWAD – Hochwasser-Schadens-Simulations-Modell) for potential damages of buildings and constructed assets is based on a new bottom up approach. At the core stands the Urban-Structural-Type (UST) approach. UST's are areas with physiognomic homogeneous characters of built up areas marked by characteristic formation of buildings and open spaces. The UST can be linked to a building typology, where representatives of buildings by age and type can be allocated. By that, modes of construction, quantity structure and materials can be assigned. It is of great importance to allocate vulnerability correctly to elements of construction like walls and ceilings in potential flood areas. Hereby the damage-potential can be calculated in quantitative and qualitative terms and the direct tangible refurbishment costs can be estimated. Other damages without direct linkage to buildings like cars or inventory do need average value approach. At present the authors are working on vulnerability orientated Urban Structure Typology. The UST will be the link to the

GIS-supported analysis of land use. The differentiation and segmentation of built up areas merges with the UST specific database. The strength of this new approach is a highly detailed model especially for the housing areas damage potential and refurbishment costs.

In VERIS additional to the residential areas the industrial zones of urban areas and areas of mixed use are investigated. For industrial areas a real state average value approach will be applied together with a scoping in order to detect hot spots which need further detailed enquiries. The combination of both object-based approaches allows a highly differentiated evaluation of the impacts of changing risks by climate and societal change. Moreover, it allows ex ante analyses of mitigation strategies.