Mesh versus bathtub – effects of flood models on exposure analysis in Switzerland

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In Switzerland, mainly two types of maps that indicate potential flood zones are available for flood exposure analyses: 1) Aquaprotect, a nationwide overview provided by the Federal Office for the Environment and 2) communal flood hazard maps available from the 26 cantons. The model used to produce Aquaprotect can be described as a bathtub approach or linear superposition method with three main parameters, namely the horizontal and vertical distance of a point to water features and the size of the river sub-basin. Whereas the determination of flood zones in Aquaprotect is based on a uniform, nationwide model, the communal flood hazard maps are less homogenous, as they have been elaborated either at communal or cantonal levels. Yet their basic content (i.e. indication of potential flood zones for three recurrence periods, with differentiation of at least three inundation depths) is described in national directives and the vast majority of communal flood hazard maps are based on 2D inundation simulations using meshes. Apart from the methodical differences between Aquaprotect and the communal flood hazard maps (and among different communal flood hazard maps), all of these maps include a layer with a similar recurrence period (i.e. Aquaprotect 250 years, flood hazard maps 300 years) beyond the intended protection level of installed structural systems.

In our study, we compare the resulting exposure by overlaying the two types of flood maps with a complete, harmonized, and nationwide dataset of building polygons. We assess the different exposure at the national level, and also consider differences among the 26 cantons and the six biogeographically unique regions, respectively. It was observed that while the nationwide exposure rates for both types of flood maps are similar, the differences within certain cantons and biogeographical regions are remarkable. We conclude that flood maps based on bathtub models are appropriate for assessments at national levels, while maps based on 2D simulations are preferable at sub-national levels.