ANTICIPATING EMERGING FLOOD RISKS

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Abstract

The EU-Flood Directive targets the reduction of existing flood risk and the avoidance of emerging new risks. Future risks depend on climate-induced changes in rainfall patterns, but also land use changes related to societal development are relevant.

Here, a methodology for assessing future flood risk in a changing environment will be presented by the help of a case study executed at the regional scale. The province of Upper Austria encompasses an area of 11 982 km2 with 1,437 Mio inhabitants living in 444 municipalities. The land use maps provided data for each municipality including residential area, public buildings, industrial and commercial areas, infrastructure, recreation and agriculture. Data were analysed for the recent status and under the assumption that the local land development plans are fully implemented. The latter constitutes an estimate of the worst-case scenario.

The recent flood risk is estimated for observed conditions while future climate induced flood risk is derived by considering the sensitivity of recent flood risk to changing inundation area and respective damage potential. The area of buildings in flood plains has been selected as a risk indicator. In twenty-one municipalities more than 100000 m^2 of buildings are recently exposed to floods with a return period larger than 200 years. In eleven municipalities, all the residential areas are located outside the flood plain. The data are categorized according to Fig.1.

Second, flood risk changes are assessed considering socio-economic development, characterised by regional demographic changes and the respective land development plans. This information provides the basis for assessment of emerging risk areas. According to internal migration trends it can be concluded that in surrounding areas of already highly developed centres the population is expected to grow, and as a consequence, residential buildings will be developed from which a substantial part may be located in flood prone areas. As a result two maps, recent risk and emerging risk, would be obtained (Fig. 2).

To prioritise the municipalities with respect to recent and emerging risks the two layers (today and future) have to be combined. As an example, as displayed in Fig. 1, we simply combined the various categories (category layer 1 + category layer 2). Of course, dependent on the weights given to recent and emerging risk different results could be obtained. However, the hot spot areas remain always clearly visible.

Then, climate induced changes in flood magnitude and corresponding inundation area were assessed. Either different regional climate model outputs could be used to generate flood events or sensitivity studies could be executed to learn about the response of inundated areas. E.g. which changes in the flood plane would occur if the flood peak would be 10% higher.

Based on Fig. 2 conclusions can be taken where land development and/or climate change impacts are dominating. Further, a clear ranking of municipalities is possible to avoid emerging risks, either by a modification of land development plans or by developing protective measures.

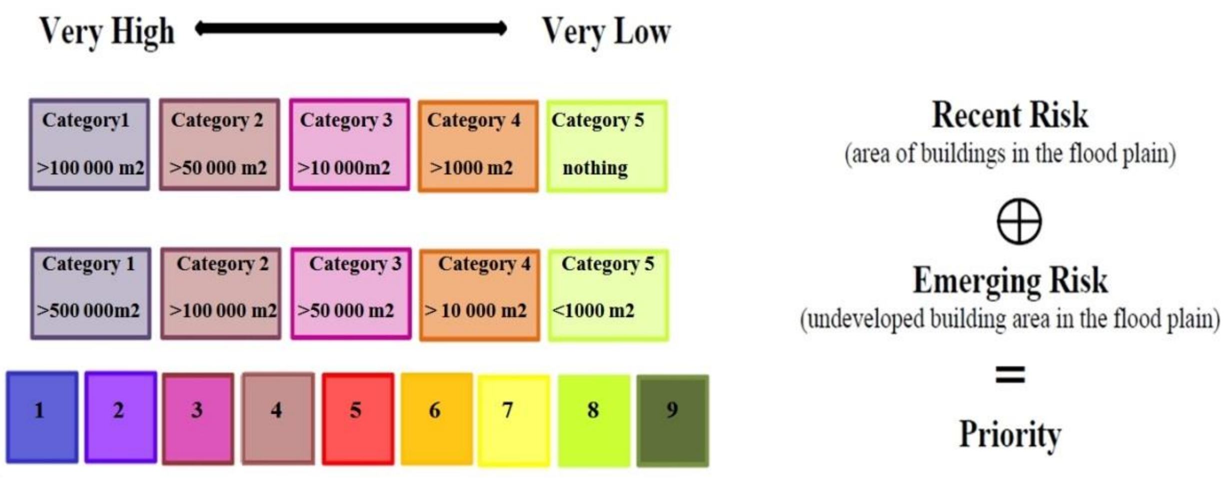

Figure 1. Classification of recent and emerging flood risk

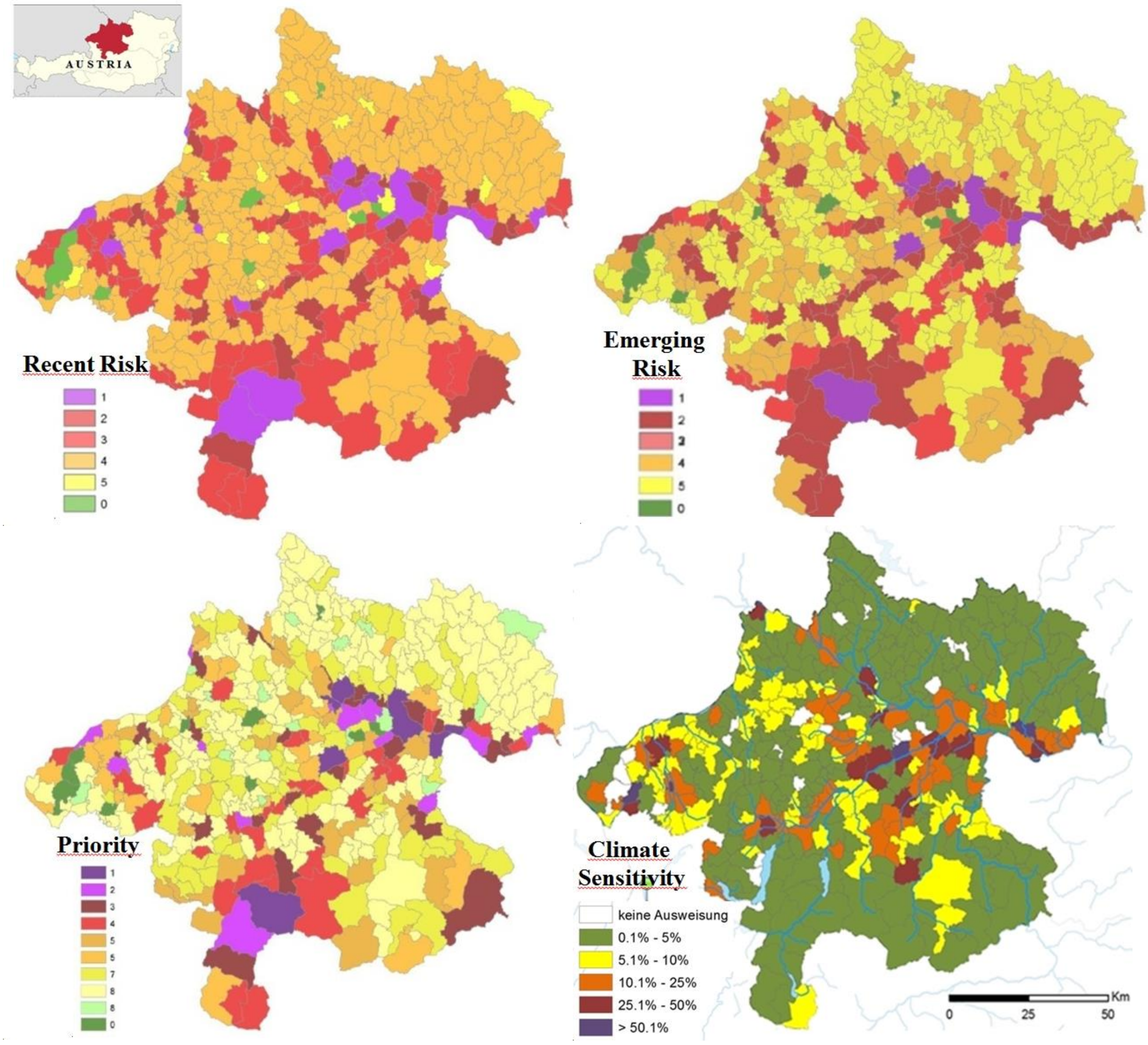

Figure 2. Indicator of recent risk (upper left), indicator of emerging risk (upper right)

keywords: flood risk assessment, climate sensitivity, risk priorization