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Investigating the meso-scale effectiveness of different type of decentralised flood reduction measures

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This contribution presents results from two projects investigating the effectiveness of decentralised flood reduction measures aimed at retaining more (flood) water “In the landscape” and to provide more “room for the river” in order to permit river inundation. The two projects comprise three meso-scale catchments within the Rhine basin and the alpine catchment of the Upper Iller in Austria and Bavaria. These four different case studies cover a rather wide range of morphological, climatological and hydrological conditions. The effectiveness of the decentralised measures has been investigated by means of analysing the results of simulation experiments, where the water and flood retention processes of three types of scenarios has been modelled: a) land use changes /from arable land to forest; and supporting the infiltration of urban storm water in urban areas; b) local water retention by a high number of small scale ponds distributed over the catchment, and c) flood peak reduction through controlled inundations along the main channel. The work show clearly, that the models have to be able to distinguish the different storm runoff generation processes, the rainfall intensities and the specific physic-geographic conditions of the area in order to derive meaningful results, which are summarized below:

A changed land-use influences the flood generation in meso-scale catchments (ca. 100 - 1000 km^2) significantly more in case of convective rain storms with high rainfall intensities (a peak reduction of up to 20%) compared to advective, fromtal rainstorms with low or only moderate rainfall intensities (a modelled peak reduction of 0% between 5%). One has to be aware that convective type of rain does not play a role for floods along the large rivers in mid latitudes, such as Central Europe, this is why land-use change is of minor importance for larger scale rivers in these regions.

The wetter the pre-event soil is, the smaller is the influence of land-use and possible decentralised retention measures for a reduction of flood peak and volume.

In high mountain areas, in general the soil is rather shallow. Therefore, the natural retention capacity of the soil (and of the catchment) is relatively small, in particular if the area is rather wet before rainfall start. A relative increase of the retention capacity of this landscape feature will still result in a rather low increase in absolute numbers. This is the reason, why even for small floods (triggered by moderate rain storms) the achievable reduction of flood peak and volume is small, i.e. a few percent only.

The water retention in the canopy is of very minor relevance, because its volume is rather small compared to flood triggering rainfall events.