



Extremes in river morphodynamics on various scales: Basics for hazard analysis and river restoration

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The hydro-morphological degradation of the European river systems is one of the main pressures on aquatic ecology. However, according to the aims of the European Water Framework Directive (WFD) a sustainable good status of our rivers have to be achieved until 2015 and at least, with some period extensions, until 2027. Moreover, a variety of international restoration project have shown, that hydro-morphological restoration of river reaches has to be seen as cost effective measures improving ecological conditions only if a certain percentage of a river reach (> 20 % in case of the Drau River) was restored and/or superior specific boundaries are given (e.g. sediment continuum). In formal contrast, another European Directive, the EU Floods Directive, addresses crucial issues in preventing hazards which might result in constraints of self-forming processes during hydrologically extremes. The experiences from the catastrophic events in 2002, 2005 and 2009, however, highlighted the fact, that there is no absolute flood protection and especially floodings, which exceed the design discharge of a 100-years event, caused serious erosional/depositional features in the floodplains on various spatial scales. Nevertheless, despite the damages and losses in infrastructure, the morphodynamic impacts of the catastrophic events caused river type specific hydro-morphological heterogeneity and habitat diversity which have to be seen as geomorphological basics and boundaries for a sustainable good ecological status. Thus, in general, extremes in river morphodynamics should be seen as a chance to fulfil both criteria of the European Flood- and Water Framework Directive for a sustainable management of our rivers if no highly relevant infrastructures are endangered. Management should include the implementation of a certain lateral corridor along the rivers for allowing self-forming processes and/or including flood affected areas into public property to reduce flood hazards and improving habitat heterogeneity (e.g. Kamp River / Austria). Management as a restriction to natural conditions, however, have to be taken according to the multipurpose use and pressure on river floodplains and the impacts on the superior scales (e.g. torrent controls in the headwaters).