

The imperative of sediment management concepts in River Basin Management Plans

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Introduction: The increasing demand for clean and healthy rivers in Europe led to the introduction of the Water Framework Directive (WFD) in 2000 [1]. The major aim of the WFD is to achieve a good ecological status/potential and good chemical status of all European surface waters.

Contemporary characteristics of rivers, transitional and coastal waters are not only controlled by local conditions within the surface water themselves, but conditioned by a multitude of interacting processes within the contributing river basin. Therefore, river basins are the preferred systems for water management, and river basin management plans (RBMPs) are the central management instruments. RBMPs that will need to be established and updated every six years, guide a multibillion-euro stream restoration industry in Europe. To effectively achieve a good ecological status/potential of river systems, RBMPs must guarantee to address the central specific issues and challenges that are specific for each river basin in Europe.

Two major challenges to achieve a good ecological status/potential for many European rivers are the hydromorphological degradation as well as the increased input of nutrients and pollutants [2]. Despite their greatly different nature, both challenges are conditioned by sediment dynamics. While hydromorphological degradation of river channels relates, next to others, to the excess or deficit of sediment (sediment quantity), water pollution is mainly controlled by sediment-associated transport of nutrients and pollutants from the contributing hillslopes and floodplains.

Despite their key functions to achieve a good ecological status/potential, an explicit consideration of sediment within RBMPs is rather the exception than the rule. Thus, to address the central issues and challenges of the WFD, sediment management concepts need to be a central component of RBMPs.

We will present four examples of sediment issues related to river management in Europe and discuss their implications for the development of RBMPs.

Methods: Four case studies are presented to highlight the link between sustainable sediment management and the aims of the WFD to achieve a good ecological status/potential. The presented case studies include i) the amplification of hyper-turbidity

in the Ems estuary system due to human interventions, ii) the decoupling of floodplains from the rivers Elbe and Danube due to human-induced river incision, iii) the flux of contaminated sediments in the Upper Rhine and iv) the potential effects of dam removals in abandoned waterways. The examples cover conditions from free-flowing moderately managed to strongly regulated (impounded) river channels. A special focus will be given on the sediment budget approach as an organizing framework for sediment management.

Results & Discussion: From the presented case studies, we derive the following statements:

- Sediment budgets of river basins provide an essential framework to achieve a detailed understanding of basin-specific sediment dynamics and of associated nutrient/pollutant fluxes.
- Hydromorphological and sedimentological conditions are closely linked and an essential basis for biological components.
- Healthy rivers require type-specific hydro-, sediment- and morphodynamics
- The knowledge of these drivers for changes is the key to the dominating mechanisms in river systems including the effects on the ecological and chemical status of surface water bodies.
- The knowledge of regional / basin-wide sediment dynamics is the key to the development of effective and sustainable sediment management concepts.
- Sediment management concepts are necessary prerequisites for integrative RBMPs that aim to achieve a good ecological quality/potential of the surface waters in Europe.
- Sediment management should be an explicit component of RBMPs.

References: [1] EC (2000): Implementation of the Water Framework Directive (2000/60/EC) [2] UBA (2016): Endbericht Workshop Hydromorphologie III. Dessau-Roßlau.