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The geomorphic legacy of dams – an Austrian case study

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Dams and their removal significantly alter the water and sediment dynamics of rivers thereby inducing a range of geomorphic channel responses that often require the installation of bed and bank protection structures. Although such measures are well-established in traditional river engineering, very little is known about the long-term effects on river sediment dynamics and channel morphology. A case study is presented in which we investigated the impact of dams, dam removals and dam-related channel protection structures on sediment connectivity and channel morphology in two heavily engineered river systems in northeast Austria.
To assess sediment connectivity along the river channels, facies mapping of river bed sediments was applied. Channel morphology was investigated by analysing longitudinal and cross-sectional channel profiles which were created in a GIS-environment based on ALS DEM-data.
Sediment facies was directly linked to channel slope and indirectly to stream power and sediment connectivity of the rivers. Dams have shown to induce fining of sediment upstream with coarsening downstream due largely to changes in channel slope. Dam-induced erosion and sedimentation processes altered channel slope/depth (longitudinal profile) and channel width/depth (cross-sectional profile). However, the expected recovery or reverse change in sediment facies and channel morphology when the dams are removed was severely hampered by the installation of river bed and bank protection structures preventing channel slope recovery. These results highlight the need to practice river restoration in a more holistic way by further considering system-specific landscape and engineering history.