

# Long-term investigation of the morphological development of groyne fields on the two waterways Elbe and Upper Rhine

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**Abstract:** To enable navigation on the rivers and for land reclamation purposes, it was necessary to fix the course of the river while causing as few morphological changes as possible. For this purpose, groynes were often built in groups as regulating structures in the past. In free-flowing river systems regulated by groynes, lateral hydrodynamic and morphodynamic processes still continue to interact between the main stream and groyne fields, so that groyne fields are subject to changes. Lateral morphological changes can lead to longitudinal changes, e.g., in riverbed elevation and water level, and thus have implications for erosion or accumulation trends of the river course. In order to assess and evaluate these changes in groyne field morphology, the Elbe has been the subject of a measurement campaign for almost a decade. In particular, the aim was to gain new insights into how the bed elevations in the groyne field change during the study period as a function of previously known influencing parameters such as discharge conditions, geometry of the groyne field, bedload offer and vegetation. A single beam and an ADCP were used to measure bed elevation, water level, and flow velocity for 2-3 adjacent groyne fields at 8 different locations between Elbe km 188 and km 571 at mean and high discharges. Because sedimentation and remobilization of sediment also depend on water discharge, measurements were also made in a cross section near the groyne fields. For groyne fields, a procedure has been established on how to define the geometric boundaries for further examinations. For the study area and the study period of about 12 years on the Elbe, no clear sedimentation or erosion trend could be proven by regular field measurement. This contribution gives an overview of the results of groyne field measurements at the river Elbe and an outlook on a characteristically different river section. In contrast to the sand-dominated Elbe, the Upper Rhine is gravel-dominated and shows further differences, e.g. a different gradient, nourishment, besides its history of anthropogenic interventions. In the free-flowing section of the Upper Rhine, a further measurement campaign was started in 2022 on the basis of the knowledge gained on the Elbe regarding measurement concept and method.