



Physical Modelling Investigation of Induced Bank Erosion as a Sediment Transport Restoration Strategy - The Case of the Old Rhine (France)

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ABSTRACT

To improve the morphodynamic and biodiversity of the Old Rhine (France) which is a stable, heavily armoured channel, a project aiming at supplying sediment to the bed through bank erosion has been initiated by EDF (Electricité de France). This technique consists of removing embankment revetment, allowing bank erosion and retreat, thus releasing sediment into the riverbed.

This paper presents results of a laboratory modelling study conducted for two specific pilot sites. The first one has a groyne field on the left (French) bank. On the second pilot site, the river exhibits an alternating sequence of pools and shallow riffles with a well-developed gravel bar along the left bank. To achieve model similarity, sand material is used to represent the prototype bank material in a 1:40 undistorted, Froude number complying model. A specific scaling approach for multi-grain size mixtures that preserves similarity of initial motion for each grain size class and of the bank stability coefficient between the model and prototype is used, but strict similarity of the Shields and particle Reynolds numbers is ignored.

A strategy devised for the first site consists of two higher, larger island groynes that replace the three existing groynes. For the second site, the strategy consists of removing the gravel bar from the left side and storing the sediment along the right bank. Both methods produce toe erosion and failure of the left bank for flow discharges below the mean annual flow rate. The field works were implemented for the first site in spring 2013, showing promising results. A comprehensive monitoring plan, covering both morphological physical parameters and ecological indicators, is under progress to confirm relevance and performance of the restoration procedure.