

## **Is braiding an endangered river species? Converging morphological trajectories from multiple geographic contexts.**

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Observations of morphological change in braided rivers, comprising narrowing of the total and active braidplain, degradation (at least in some reaches), increase in vegetation cover, and reduction of braiding complexity towards a transitional style, have been increasingly reported worldwide in the last decades. Most of the available literature concerns rivers in Europe, with particular reference to the Alpine and pre-Alpine region (e.g., Italy, France, Austria, Switzerland). This abundance reflects the magnitude of changes in Europe, where most of braided reaches have been heavily impacted. However, contributions from other regions of Europe (e.g., the Polish Carpathians, Spain, Scotland, Corsica) and of the Earth (e.g., the South Island of New Zealand) document similar stories.

These morphodynamic changes have been related to the alteration of the fundamental physical processes in braided rivers driven by the flow and sediment supply regimes, due to anthropogenic changes in constraints and controls. Multiple and context-specific sources of impact on these controls have been identified, including damming, landuse change, gravel mining, torrent control works, channelisation, introduction of alien vegetation.

Here, we focus on a comparative analysis of the relatively recent (multi-decadal) evolution of braided rivers located in different geographic regions on the Earth, with particular reference to the Waitaki (New Zealand), Piave (Italy) and Dunajec (Poland) rivers. These rivers display similar morphological trajectories, which nonetheless result from very different paths of causation, i.e. from different management causes and different alteration of physical processes. We focus on the role of different physical and human geographic contexts as drivers of the river evolution, highlighting the relations between the observed trajectories and the local conditions and characteristics. We discuss the relative role of dam construction and operation in contributing to the observed trajectories, and the prediction of future evolutionary trajectories through numerical morphodynamic modelling.