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Enhancing River-Sea System Understanding by providing insights into headwaters– the Upper Danube Austria Supersite of DANUBIUS-RI

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Austria has a share in three international river basins (Danube, Elbe, Rhine), but by far the most of its territory (> 96%) drains into the Danube. This Austrian territory accounts for 10% of the total area of the Danube River Basin and belongs entirely to the Upper Danube Basins, which extends from the source of the Danube in Germany to Bratislava at Austria's eastern border to Slovakia. Austria contributes approx. 25% (ca. 50 km³/a) to the total yearly discharge of the Danube into the Black Sea (ca. 200 km³/a).

Human activities have severely altered the Upper Danube catchment, impacting both the main stem and the main pre-alpine tributaries. Due to the Upper Danube's considerable natural gradient and mountainous character, this part of the Danube is extensively used for hydropower production. Ten large (> 10 MW) hydropower plants are situated along the Austrian Danube (out of a total of 41), and only two Danube stretches can still be characterized as free-flowing (Wachau, Nationalpark Donau-Auen). Besides energy generation, other human activities such as agriculture, shipping, industrialisation, urbanisation and tourism, have been and still are changing the process and system dynamics of the Upper Danube. Climate change is additionally affecting this already heavily impacted River System.

The Upper Danube Austria and its pre-alpine network of tributaries is therefore an ideal case study region to investigate the multiple effects of human activities on riverine systems and was chosen as a "supersite" within Danubius-RI, the "International Centre for Advanced Studies on River-Sea Systems". Danubius-RI is being developed as distributed Research Infrastructures with the goal to support interdisciplinary and integrated research on river-sea systems. DANUBIUS-RI aims to enable and support research addressing the conflicts between society's demands, environmental change and environmental protection for river -sea systems worldwide and brings together research on freshwaters and the interface to marine waters, drawing on existing research excellence across Europe.

The supersite "Upper Danube Austria and its pre-alpine network of tributaries" covers the freshwater spectrum within the river-sea continuum, ranging from alpine and pre-alpine

headwater streams along major Danube tributaries to the Danube River, including adjacent floodplains in the Upper Danube catchment. The research focus lies on the interactive effects of climate change, land use pressures, and hydromorphological alterations on the biodiversity, ecological functions, and the ecosystem service provision of streams and rivers in the Upper Danube basin and their role within the catchment.

The Supersite “Upper Danube Austria and its pre-alpine network of tributaries” joins forces of eight Austrian research institutions and is led by WasserCluster Lunz and the Institute for Hydrobiology and Aquatic Ecosystem Management (IHG) at the University of Natural Resources and Life Sciences, Vienna (BOKU). Research on sustainable management and restoration of riverine landscapes (WFD, FD, HD, Biodiversity Strategy) in the Upper Danube Catchment is an important contribution to a healthy River-Sea System of the Danube River Basin as a whole.

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