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A new ESFRI research infrastructure: "The International Centre for Advanced Studies on River-Sea Systems" – DANUBIUS-RI

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The "International Centre for Advanced Studies on River-Sea Systems" (DANUBIUS-RI, http://www.danubius-ri.eu/) has been included on the Roadmap of the European Strategic Forum for Research Infrastructures (ESFRI) since 2016. It is currently being developed as distributed research infrastructure (RI, envisaged lifetime >30 years) in 16 countries in Europe under the lead of Romania. DANUBIUS-RI shall become operational by 2023. The overall aim is to support interdisciplinary research on river-sea systems.

River-Sea systems are a key component with respect to food and energy production, transport, and societal wellbeing. They face pressures from natural and anthropogenic driven environmental perturbations at local and global scales. European research on river – sea systems, including the transitional zones between freshwater and marine environments, with their transitional character has been fragmented, largely discipline- and geographically isolated.

The new research infrastructure will also enable and support research addressing the conflicts between society's demands, environmental change and environmental protection for river -sea systems worldwide. DANUBIUS-RI will conjoin research on freshwaters and the interface to marine waters, drawing on existing research excellence across Europe. It will provide access to a range of European River-Sea systems and will foster the knowledge exchange as well as the access to harmonized data; education and training.

Overarching questions that need to tackled are: How are River-Sea-Systems changing due to natural and anthropogenic pressures? What are the drivers behind these changes? How are these changes affecting River-Sea system functioning and services? How can we distinguish between natural variability versus human induced changes? Which changes reduce the resilience of the socio-ecologic system of rivers and seas? How can we sustainably use River-Sea-Systems? How can gaps between existing European environmental policies be bridged (WFD, FD, MSFD, MSPD, Nitrates Directive, Habitat Directive, Natura 2000 etc.)? How can the UN's Sustainable Development Goals be linked, particularly SDG 6 (Clean Water and Sanitation) and 14 (Life below Water)?

The Research Infrastructure will comprise a Hub and Data Centre, a Technology Transfer Office, as well as Supersites and Nodes across Europe. Nodes will cover Observation, Analysis, Modelling and Socio-Economic Impact. They will provide facilities and services, data-storage and -provision, experimental and in-situ facilities. Supersites will be complementary natural test sites for observation, research and modelling utilizing a range of predefined (standardized) and experimental methods to study River-Sea systems. Current Supersites are Elbe-North Sea, Thames Estuary, Nestos, Po Delta and Venice Lagoon, Ebro-Llobregat Deltaic System, and along the Danube: Lake Lunz in the upper Danube catchment, Szigetköz – in the middle Danube and Danube Delta – Western Black Sea. Currently two new supersites along the Rhine River as Europe's largest river are planned to be included in the Netherlands and Germany, as well as one in the Guadalquivir Estuary (Spain) and Tay River (UK).