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## DANUBIUS-RI: Future Vision and Research Needs for River-Sea Systems

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More than three quarters of the Earth's land surface is connected to the ocean by rivers. This natural connection between land and ocean by rivers, estuaries and deltas, as well as coastal seas, is essential for humankind in providing key ecosystem services (incl. food and water). However, the quantity and quality of water and sediment transported along the river-sea continuum is changing fundamentally with implications for the structure and functioning of associated ecosystems that are in turn affecting the continued provision of ecosystem services.

DANUBIUS-RI, the International Centre for Advanced Studies on River-Sea Systems, is a distributed research infrastructure (RI) integrating studies of rivers and their catchments, transitional waters, such as estuaries, deltas and lagoons, and their adjacent coastal seas (i.e. River-Sea Systems). DANUBIUS-RI's vision is to achieve healthy River-Sea Systems and advance their sustainable management in order to live within the planet's ecological limits by 2050. DANUBIUS-RI's mission is to facilitate excellent research from the river source to the sea by (1) providing access to state-of-the-art facilities, methods and tools, as well as samples and data; (2) bringing together relevant expertise to advance process and system understanding and to enhance stakeholder engagement; and (3) enabling the development of integrated management and policy-making in River-Sea Systems. DANUBIUS-RI's mission-oriented, integrated, interdisciplinary and participatory approach seeks to change the process and system understanding of River-Sea Systems and their respective management.

DANUBIUS-RI's Science & Innovation Agenda is guiding the RI's evolution as it progresses from preparation through implementation to operation. It describes DANUBIUS-RI's vision, mission and approach, and provides a scientific framework for the RI's design and highlights the research priorities for the first five years. The framework includes interrelated key challenges in River-Sea Systems, such as global change including climate change and extreme events, changes in hydromorphology, the quantity and quality of water and sediment across the river-sea continuum as well as the structure and functioning of associated ecosystems. DANUBIUS-RI's research priorities are in line with forthcoming missions of Horizon Europe, which have been applied to

River-Sea Systems (1): “Achieving healthy inland, transitional and coastal waters” including the research priorities (a) Water Quantity, (b) Sediment Balance, (c) Nutrients and Pollutants, (d) Biodiversity, (e) Ecosystem Services; and (2): “Adapting to Climate Change: Enhancing Resilience of River-Sea Systems” including the research priorities (f) Climate Change, (g) Extreme Events.

In 2016, the European Strategy Forum for Research Infrastructures (ESFRI) included DANUBIUS-RI in its roadmap highlighting the need for a research infrastructure at the freshwater-marine interface. The Horizon 2020 project DANUBIUS-PP (Preparatory Phase) has built the scientific, legal and financial foundation to enable DANUBIUS-RI to proceed to implementation ([www.danubius-pp.eu](http://www.danubius-pp.eu)).

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