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# Resilient Solutions for Coastal, Urban, Estuarine and Riverine Environments

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# RESCUER MSCA Doctoral Network

## REsilient Solutions for Coastal, Urban, Estuarine, Riverine environments



Funded by the  
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### Coastal Modelling and Hazards (WP1)

**Context:** Development of numerical tools to represent wave action in the nearshore zone in a more complete way than what is the present standard.

**Goal:** Improve phase-resolving models allowing wave-by-wave description over *steep bathymetries, complex coastal geometries*, and enabling *operational use* for wave forecasting.

### River and estuary Dynamics (WP2)

**Context:** Numerical modeling of waves and currents in river and estuaries involving complex geometries, porous bed types, bedload transport and bed erosion.

**Goal:** (a) Usage of GPUs to accelerate the codes. (b) Dedicated laboratory tests will be designed to allow the model validation in terms of both hydrodynamics and sediment transport in the surf zone. (c) Application to a real environment, leveraging the data collected at the field site of Senigallia (Central Italy).

### Urban flooding (WP3)

**Context:** Urban areas are being significantly affected by flood events, and the flood risk is a major issue which must be addressed at several levels. Management of urban floods will be informed by dedicated laboratory tests.

**Goal:** Development of high order shallow water models with precise representation of topography and buildings. High-resolution descriptions of both coastlines and structures. Numerical and physical modelling of urban flows by taking into account courtyards, urban furniture, parked cars, and other urban irregularities.

### Water quality (WP4)

**Context:** Water pollution is a systemic problem for environmental and human health. One of the key issues to understand is the transport and fate of sediments, plastics and other pollutants.

**Goal:** Development, calibration and validation of an integrated hydraulic and biochemical model able to simulate the complete urban coastal wastewater system including the flow dynamics and various water quality aspects.

### 10 Fellowships

- Wind-wave coupling for improved modelling of coastal flooding. WP 1
- Stable simulation methods for structured multi-block grids. WP 1, WP 2
- Development of phase-resolved operational wave forecasting with irregular bathymetry. WP1, WP 4
- Tracing ocean swell in fjord systems. WP 1
- Flow patterns of pollutants/microplastics in estuaries-managing human impacts. WP 2, WP 4
- Multi-physics shallow-water models for river and estuary dynamics. WP 2
- Advancing Flood Modeling: Integrating HO numerical methods for accurate urban flooding prediction. WP 3
- Modelling flows in estuarine urban environments. WP 3, WP 2
- Assessment of surface water interaction and pollutant dispersion between urban watershed, canals and coastal flows. WP 4, WP 3, WP 1
- Mixing and wave-driven transport of pollutants in the surf zone. WP 4

### Beneficiaries

