



ECO  
C<sup>2</sup>S

# Ecosystem services to enhance the resilience of coastal regions and communities to flood risks in a catchment to sea perspective



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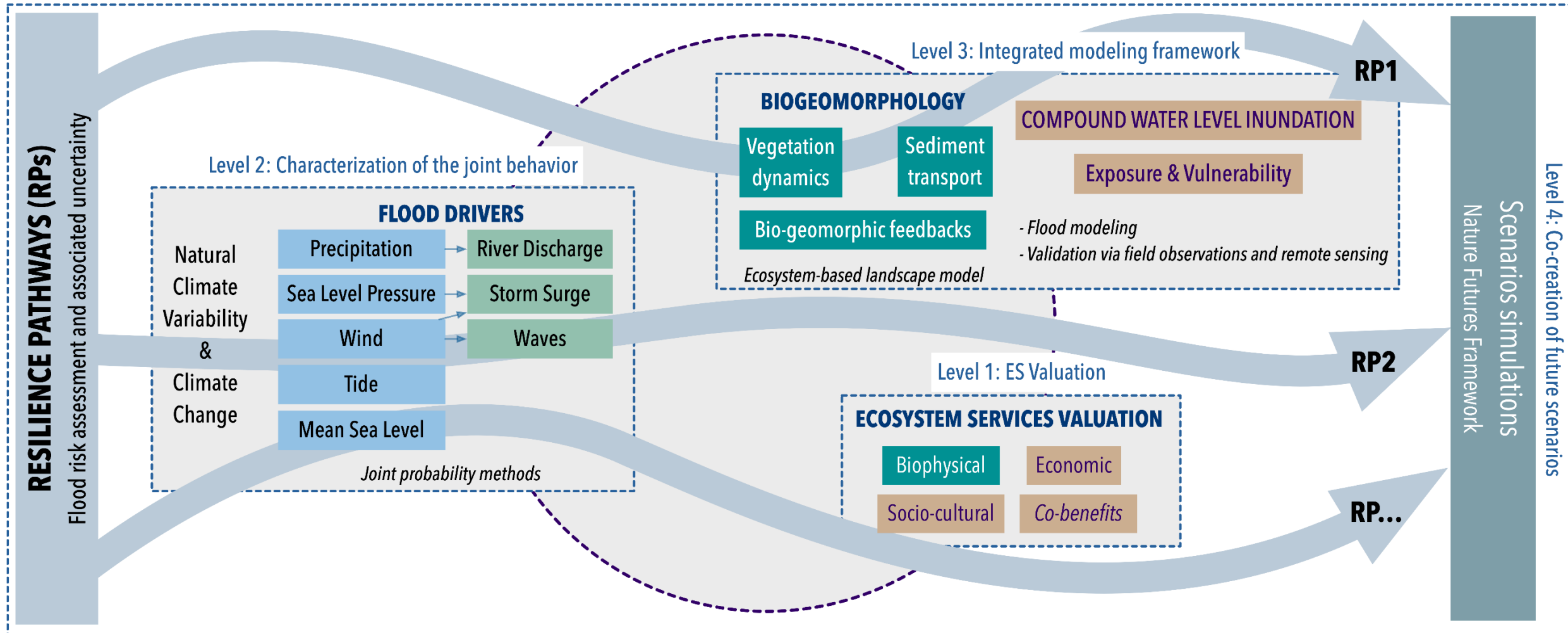
## Level 1: Co-definition of knowledge gaps

### STAKEHOLDER'S ENGAGEMENT, CO-DESIGN AND CAPACITY BUILDING

Anthropogenic pressures (loss of habitat, changes in hydrological connectivity, landscape organization, etc.)

Perceived risks and protection behaviors

Social and governance barriers to implementation



## Level 5: Framework based on resilience pathways

# Thank you for your attention



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## Ecosystem services to enhance the resilience of coastal regions and communities to flood risks in a catchment to sea perspective

## Background

**Crustal systems support biodiversity and provide critical ecosystem services**, including flood protection. The effects of climate change enhance hazards in such flood-prone areas and place additional physical pressure on ecosystem services, while also adding pressure to the social system, by interfering with people's socio-cultural and socio-economic valuation of such places, with potential consequences to their place identity and their motivation, emotions, cognitions and behaviours associated with them. This creates an **urgent need for reliable risk assessment, management and communication methods and innovative community engagement approaches through stakeholders co-design methods**, towards reducing vulnerabilities, protecting what people value, and enhancing socio-physical systems adaptation towards building resilience.

**Many catastrophic floods have a compound dimension**, where the interaction of multivariate and multiscale drivers usually exacerbates their effects. This is particularly true for estuarine cities and regions and calls for a holistic approach to flood risk management, combining both physical and ecological drivers and feedback.

### Objectives and Methods

Eco2S aims to **co-develop a holistic approach to flood risk assessment**, quantifying the contribution of natural systems and blue-green infrastructure to flood protection in transitional and coastal areas and supporting the co-creation of **resilient pathways based on ecosystem services**.

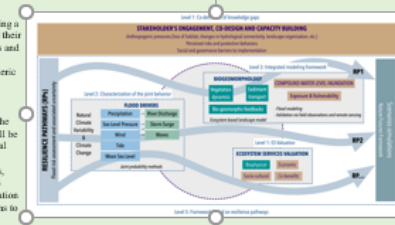
## MAIN OBJECTIVES

- Assessment of flood risk jointly considering geophysical and societal preconditions and relevant flood drivers.
- Contribution of meteorological, geo-morphodynamic and human drivers to flood impact.
- Validation of water flow regulation by inland and coastal ecosystems.
- Functionality of ecosystems and blue-green infrastructure in a CC context.
- Socio-cultural and economic value of ES for local communities, and how changes in ES affect perception and acceptance of ES solutions.
- Formulation of research needs and co-design of ES-based pathways with local communities and stakeholders.
- Promotion of resilience pathways based on ES, multifunctional, flexible, gender-responsive and adaptive to uncertainties.



### KEY ASPECTS

1. Co-identification of knowledge gaps and ecosystem services valuation, following participatory approach. Use of counterfactual analysis to assess food flows and ecosystem services as well as human preferences and perceptions of ecosystem services and their value.
2. Characterization of past behaviour of geographical preconditions with atmospheric and land use changes, and identification of the key variables and their interactions. Identification of the key variables to define the probability of occurrence of compound extreme events.
3. Integrated modelling framework that includes co-morphodynamic effects on compound food hazard. The long-term eco-morphological evolution, driven by the changes in land use, is modelled using a coupled system of equations. The model is analysed with a combination of remote sensing, field measurements and numerical simulations.
4. Development of future scenarios for sustainable and resilient ecosystem services combining different actors to co-create and co-realize solution-oriented pathways.
5. Establishment of a framework that guides the development of long-term mitigation measures and management strategies that enhance the resilience of coastal systems.



**The methodology will be tested in two case studies at the river basin level: 1) Cádiz Bay in Spain and 2) Siciliapolis in Italy.**  
Both are coastal systems with compound flooding potential and are highly impacted by human activity. They represent typical European archetypes, reflecting different contributions of the flooding drivers, ecosystem services potential, and catchment and coastal typologies. In this context, archetypes are used as a structured way to better classify, understand, and address the complexities of compound flooding. They help identify recurring patterns and assess the potential likelihood and impact of flood events. Additionally, archetypes serve as a useful tool to improve communication among scientists, policymakers, and the public, supporting the collaborative development of strategies to enhance resilience.



## Get in touch

We are looking for additional case studies and new stakeholders.  
Get in touch if you are interested!

