THE EVREST PROJECT: EVOLUTION AND RESILIENCE OF BARRIER ISLAND SYSTEMS

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Abstract

The present paper focusses on the objectives and methodology of the EVREST project regarding the identification of natural mechanisms that promote resilience in barrier island systems, both in oceanfront and backbarrier environments. The study area of the project is the Ria Formosa barrier island system, located in southern Portugal.

Keywords: Resilience; Barrier islands; Dunes; Marshes; Ria Formosa.

1. Introduction

Even though the Ria Formosa barrier system is one of the most extensively studied coastal systems of Portugal, a dedicated analysis and assessment of its resilience has yet to be developed. This is the main aim of the EVREST project, namely to develop a resilience conceptual scheme and indexes that identify coastal barrier environments self-organisation capacity and limits of the system to absorb disturbance. More specifically, the objectives of EVREST include: 1) identification of natural mechanisms that promote resilience in oceanfront and backbarrier environments, 2) quantification of evolutionary rates in response to several coastal change drivers and 3) evaluation of scenarios of barrier system evolution based on numerical modelling simulations.

2. Fundamentals and Methods

The resilience of a complex system, such as Ria Formosa, can be defined as its capacity to absorb disturbances or shocks, re-reorganize and adapt to change while retaining its structure, identity and feedbacks (Folke, 2006). Theories of complex systems view them as process-dependent systems with feedbacks among multiple scales that allow them to self-organize (Figure 1a). As elaborated in the concept of *panarchy* (Gunderson and Holling, 2002), resilience studies seek to investigate the interaction between longer term, slow changes and drivers of change (e.g. climate change) and rapid ones (e.g. storms). Thus, to assess the resilience of Ria Formosa, the system will be analysed as a nested set of adaptive cycles, dividing subsystems according to their spatial and temporal scales, while accounting for the connections between the cycles in conditions of change (Figure 1a). These cross-scale connections, termed '*revolt*' and '*remember*' by Gunderson and Holling (2002), correspond to the impact that a collapsing level (Ω phase) can have on the next larger and slower one and to the influence that the conservation (K) phase can have to the renewal of a level, by drawing on potential accumulated and stored in a larger, slower cycle.

Examples of potential interactions between drivers promoting change and the related impacts on different aspects of Ria Formosa are presented in Figure 1b, referring to distinct temporal and spatial scales. The EVREST project focusses on four geomorphological environments: a) barrier islands (Cabanas/Cacela Island), b) dunes (Barreta Island), c) salt marshes (Culatra Island) and d) pristine stable zones (Tavira Island). The data utilised to this aim include vertical aerial photographs, bathymetric and topographic maps, high-resolution LIDAR-based terrain models, tidal gauge, wave buoy and wave hindcast time-series, as well as results reported in literature.

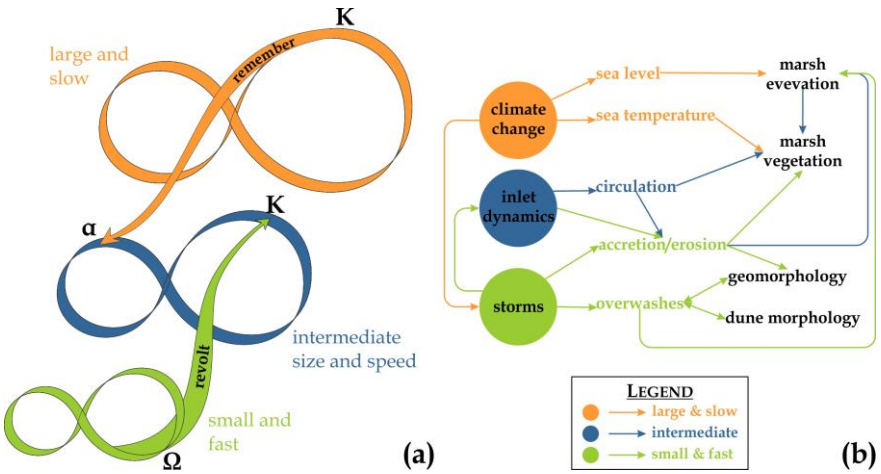

Figure 1. Schematic representations of: (a) a *panarchy* consisting of a nested set of adaptive cycles [modified after Gunderson and Holling, 2002] and (b) driver-impact links in Ria Formosa.

3. Conclusions

Aim of the paper is to present the general objectives and methodology of the EVREST project. EVREST aspires to determine the medium and long-term resilience of the complex Ria Formosa barrier island system, assessment that will be performed for the first time, based on the most complete and accurate representation of the eco-geomorphological system and utilizing all available data sources.

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