

PORTUGUESE COASTAL HERITAGE IN THE FACE OF CLIMATE CHANGE: A CALL FOR INTEGRATED MANAGEMENT



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Introduction

Coastal archaeological heritage is increasingly threatened by the combined effects of climate change and human activity.

In Portugal, coastal erosion, sea-level rise, and extreme weather events are accelerating the degradation of archaeological sites.

Despite growing international concern, no comprehensive and systematic assessment of coastal archaeological vulnerability has yet been conducted at the national scale.

The COASTLINE project aims to address this gap by integrating environmental and archaeological data to support heritage management strategies.

Objectives

- 1 Create a National Geospatial Review Protocol.**
Launch an initiative to correct and validate records from the Endevoico, using field surveys and involving universities and municipalities.
- 2 Implement a Technological Monitoring System**
Systematically use technologies such as LiDAR, drones, and digital photography to monitor in real time the evolution of the most vulnerable sites.
- 3 Integrate Heritage Risk into Coastal Management Plans**
Ensure that archaeological heritage - currently largely absent from these strategies - is explicitly considered and protected in Coastal Zone Management Programs (PZC) and other climate adaptation policies.
- 4 Form Regional Safeguarding Committees**
Establish multidisciplinary working groups (public authorities, municipalities, academia, and local communities) focused on high-risk areas to speed up decision-making and the implementation of preventive measures.

Study area

The study focuses on the Portuguese coastline, considering archaeological sites located within 100 metres of the shoreline.

A total of 486 sites were identified through national databases, spanning from the Palaeolithic to the contemporary period.

The coastline was divided into four regions: North, Centre, Alentejo, and Algarve, reflecting geomorphological and archaeological diversity.

Methodology

	Action	Tools	Output
Pre-Fieldwork	Documentary review; GIS analysis; site selection	Satellite imagery; LiDAR; spatial datasets; GIS	Risk maps; selected sample
Fieldwork	Site relocation; condition assessment; archaeological recording	GPS; photogrammetry; drones; vulnerability assessment grid	3D models; field database
Post-Fieldwork	Data validation; statistical extrapolation	GIS; statistical analysis;	Corrected geodatabase; risk evaluation
Decision & Integration	Framework development; stakeholder engagement	Analytical tools; institutional consultation	Vulnerability framework; policy tools; interactive maps

Bibliography

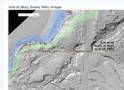
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Results

The COASTLINE project identified, in its first phase: 288 archaeological sites (excluding the Algarve region) located within 100 metres of the Portuguese coastline. 220 sites are at risk (76%) of which 204 in high risk.

More than half are prehistoric sites, and 137 are classified as "open-air stations", a category largely reflecting a lack of detailed archaeological studies.

Case study: Forte de Milreu, Ericeira, Portugal.



The fort was mislocated by approximately 300 metres inland. Field verification, combined with satellite imagery and LiDAR data, revealed that the site is on the cliff edge and already affected by active erosion.

→ This example highlights how geolocation errors can lead to significant underestimation of risk, reinforcing the need for systematic field validation.

In its second phase, the project aims to deliver the following results:

- Validation of geolocation accuracy of coastal archaeological records and estimation of the real proportion of sites at imminent risk, together with the production of 3D documentation for the most threatened sites
- Development of the first national systematic assessment of preservation status, along with a replicable vulnerability assessment grid as a decision-support tool
- Proposal of a national protocol for the revision of coastal archaeological records (IP-IC), supported by policy recommendations and Priority Intervention Sheets (PIS) for national and municipal institutions

Discussion

The results highlight a critical level of vulnerability affecting Portuguese coastal archaeological heritage.

The high proportion of sites at risk (76%) suggests an urgent need for intervention, although this figure is likely underestimated due to geolocation inaccuracies and incomplete records.

These limitations reveal a major issue: current heritage databases are insufficient for effective risk assessment and decision-making.

The project therefore demonstrates the necessity of:

- field validation
- improved data accuracy
- standardised assessment tools

More broadly, it underlines the importance of integrating climate change into heritage management strategies, and of strengthening collaboration between scientific research and public institutions.

Conclusion

Portuguese coastal archaeological heritage is facing a critical and potentially underestimated risk of loss under the combined effects of climate change and human pressure.

The COASTLINE project provides new data, validated methodologies, and operational tools to support more effective heritage management.

By bridging the gap between scientific research and decision-making, it contributes to the development of proactive and sustainable strategies for coastal heritage preservation.

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