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Landscape Transformations and Heritage Management in Galicia: Insights from the Ulló Saltworks Complex

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Abstract

The Galician Rias represent a unique and distinctive geographical entity within the context of the Iberian territory. Characterised by their estuarine geomorphology, resulting from the submersion of ancient fluvial valleys, they hold significant ecological and cultural value. Currently perceived as natural heritage, their utilisation for productive purposes has been a key driver of structured human settlement and economic development in the surrounding region. This article aims to systematise the main historical transformations of the Galician Rias through an interdisciplinary methodology, combining the overlaying of historical and contemporary cartographic sources with the documentary analysis of primary and secondary records. This approach enables the reconstruction and interpretation of landscape transformations, producing a narrative of the evolutionary processes that have shaped these areas. The research seeks to contribute to the formulation, extension, and diversification of protective measures for Galicia's riparian zones, while simultaneously raising awareness of the importance of safeguarding archaeological remains from classical, medieval, and pre-industrial periods. These vestiges are increasingly under threat from profound alterations to their natural and anthropogenic contexts. Additionally, the study highlights the value of preserving this heritage to foster public awareness of the need to protect these fragile landscapes.

Keywords: cultural landscape; cultural heritage; urban landscape; Roman built heritage; pre-industrial heritage; protected natural landscapes; Galician Rias

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1. Introduction

1.1. Subject and Objectives of the Research

The region of *Rías Baixas* constitute one of the most distinctive coastal cultural landscapes of Atlantic Europe. Drowned river valleys, terraced slopes and dispersed settlement patterns form a tightly interwoven socio-ecological system shaped by long-term interactions between human activity and a complex maritime environment [1,2]. This hybrid condition, simultaneously rural, littoral and increasingly urbanised, has produced a landscape characterised by a high degree of permeability between land and sea, where vernacular practices and spatial structures reveal enduring cultural continuity [3,4]. These attributes make the

region a paradigmatic setting for examining the relationships between heritage, landscape and territorial planning [5].

Within this framework, the research addresses the growing tension between landscape heritage and contemporary spatial-planning instruments. Current European planning policies frequently undervalue areas of archaeological potential, treating them as secondary constraints rather than as primary cultural resources. Broad land-use classifications often obscure local archaeological sensitivities, while environmental assessments tend to privilege ecological indicators over cultural stratigraphy [6,7]. The fragmentation of heritage governance further limits early intervention and weakens predictive and preventive approaches [8]. As a result, many archaeological landscapes remain exposed to irreversible transformation [9].

The objective of this research is to assess how culturally stratified coastal landscapes can be more effectively identified, interpreted and safeguarded within planning and heritage-management frameworks. By focusing on a historically layered site, the study seeks to demonstrate the relevance of cultural landscape approaches in integrating archaeological potential, environmental dynamics and spatial planning.

1.2. The Study Area

The Ulló Saltworks (*Salinas de Ulló*), located on the northern margin of the Vigo Ria, within the municipality of Vilaboa (Pontevedra), constitute a significant case study within the *Rías Baixas* context (Figure 1). They represent a dynamic yet highly vulnerable cultural landscape, shaped by centuries of interaction between tidal processes, productive infrastructures and human settlement [10].

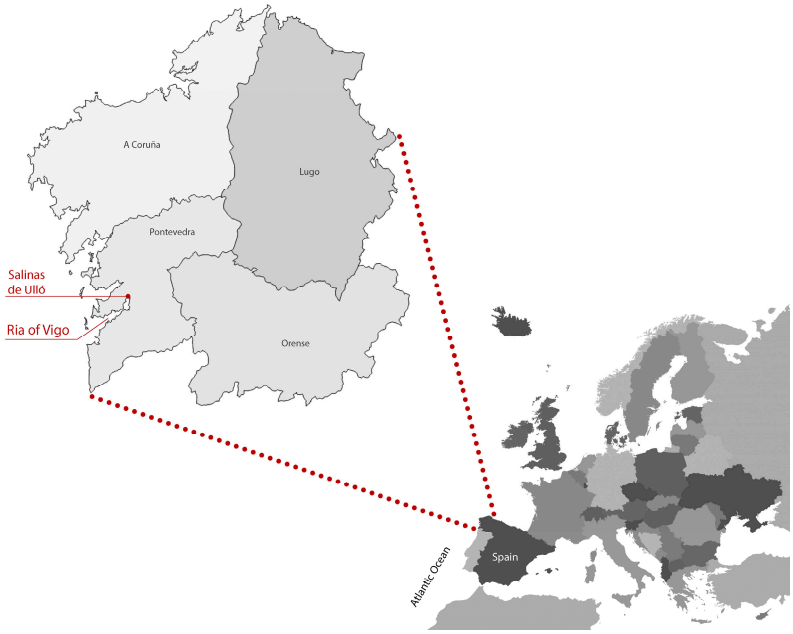

Figure 1. Geographical location of the Ulló saltworks.

Although most documentary references date the development of the saltworks to the seventeenth century, territorial appropriation can be traced back to the Roman period. The density of archaeological remains in the surrounding area, together with the strategic importance of salt production within the Roman economic system, suggests a high probability of earlier occupation [11,12].

The Ulló saltworks exploited tidal forces to extract salt, a vital commodity for food preservation. The complex consists of two contiguous rectangular ponds constructed within a natural inlet at the end of the estuary. In the larger basin, seawater introduced

by tidal action underwent partial evaporation through solar exposure and ventilation, remaining stagnant for approximately thirty days until reaching around 18 °C, enabling pre-crystallisation [13]. The brine was then transferred to the adjacent basin, where crystallisation occurred at higher temperatures within orthogonal compartments, facilitating salt harvesting [14]. Recent documentation initiatives have highlighted both the heritage value and the vulnerability of this coastal industrial landscape, underlining the need for integrated conservation and monitoring strategies [15].

Conceptually, the Ulló Saltworks exemplify a cultural landscape understood as the combined work of nature and humankind, reflecting the evolution of human settlement under specific environmental, social and economic conditions [16,17]. Their tangible elements include the salt ponds, tidal-mill remains and associated built structures, while intangible dimensions encompass historical production practices and collective cultural memory. Effective preservation requires coordinated legal, technical and community-based instruments capable of addressing both physical integrity and cultural significance [18,19].

2. Materials and Methods

This study investigates how vulnerable coastal cultural landscapes, such as the Ulló saltworks, can be more coherently integrated into spatial-planning and heritage-management frameworks. It addresses the research question of whether current planning instruments adequately recognise archaeological and cultural stratification in dynamic coastal environments. The analysis supports the hypothesis that cultural landscape-based approaches offer a more effective framework for anticipating risk, strengthening protection and reconciling heritage values with territorial development.

The present research was raised during an exploratory academic essay, focussing the Ulló Saltworks heritage value, which provided the conceptual and analytical basis for its prerogatives [13]. The cited study, following a descriptive approach, provided a detailed characterisation of the principal stages in the territorial development of the site. The present article highlights one of its key long-term ambitions: To enhance the development of the technical and conceptual basis required to critically reassess and reformulate the legislative framework governing the site's heritage protection. Accordingly, the article is organised around the integration of two core components:

1. A systematic exposition of the territorial evolution of the Ulló saltpans, with particular emphasis on their historical and natural specificities, thereby highlighting the attributes that underpin their heritage significance.
2. A comparative analysis of the current legal framework, aimed at identifying potential inconsistencies, limitations, and opportunities for its critical reformulation. The identification of landscape alterations involves analysing physical, ecological, and cultural changes over time. This process often employs a combination of historical cartographic analysis, remote sensing, and field surveys to trace shifts in land use, geomorphological features, and vegetation cover [20]. Key factors include natural processes such as erosion, sediment deposition, and sea-level fluctuations, as well as anthropogenic influences like urbanisation, industrialisation, and infrastructure development. The goal is to understand how these changes reflect broader socio-environmental dynamics and their implications for regional ecosystems, heritage, and human activity [17].

Systematising the evolutionary process requires integrating historical, ecological, and archaeological data into a coherent narrative that traces the transformation of landscapes through time [21]. This involves identifying major phases of change, linking them to driving factors, natural or human-induced, and situating them within a broader context of historical development. Such systematisation provides critical insights into the interaction

between human societies and their environments, highlighting patterns of adaptation, resilience, and impact. It is a foundational step for informed management and conservation strategies, as well as for fostering public awareness of landscape heritage [22].

In order to pursue these aims, and considering the nature of the collected data, the research team resorted to methos of documental analysis, dividing the process in two major segments.

For the first segmented, oriented to geographical characterization, the research team resort to the analysis of historical cartography, cadastral register, aerial orthophotos and actual satellite images. Using digital superimposing techniques, the research team have created speculative mappings of the major territorial manifestations over the corresponding time span [23]. The correlation between them is corroborated with regional archaeological reports and historic description. The attempted georeferenced accuracy enables to configurate a visual landscape simulation, providing valid insights to deeper and extensive territorial relations, wither natural or artificial. The usage of historical cartography reveal itself full of challenges (Figure 2). If, by one side the medieval techniques did not permit a precise spatial configuration, the symbolic depiction presented very significant information regarding the cultural relevance of the represented events [24]. The scale and nature of the surveyed object, the Ria of Vigo, admitted a significative error tolerance, in order to achieve an overall interpretation of the region and of the legislative figure.

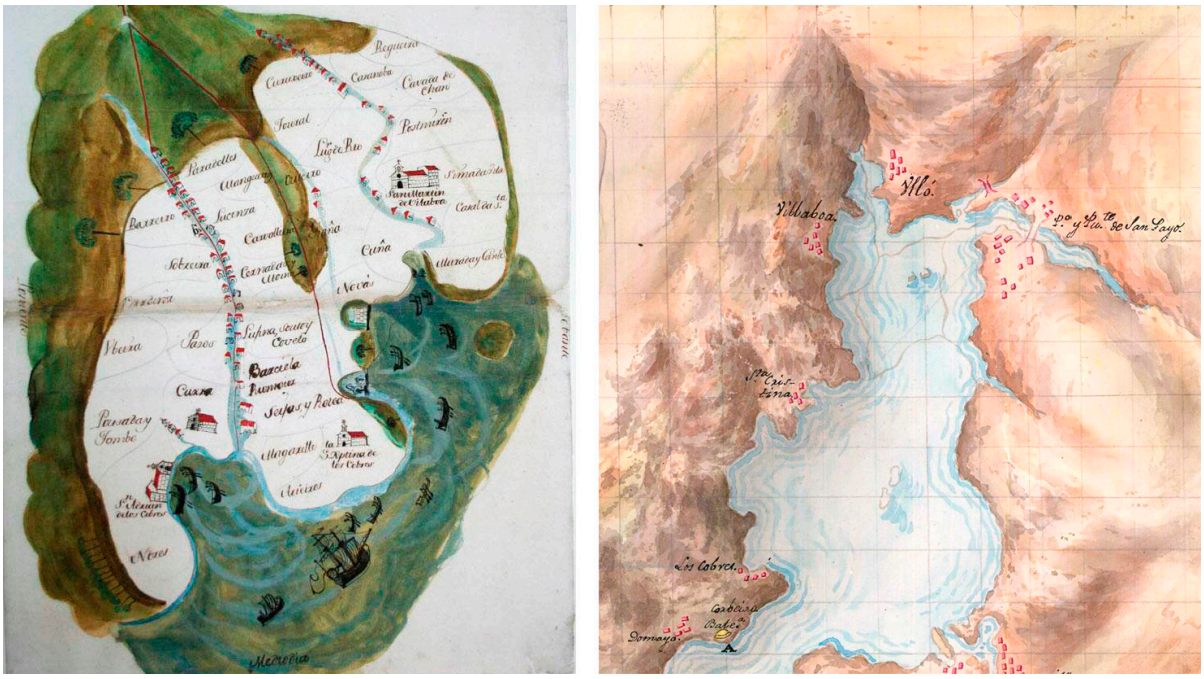

Figure 2. Examples of early historical cartographic sources depicting the study area, based on eighteenth-century maps dated 1752 and 1788.

In the second research segment, documental analysis was applied to all active Spanish Heritage laws applicable to such scale. Textual analysis was conducted to compare and differentiate legal frameworks on the protection of cultural landscapes [25]. From the Spanish heritage legislation, 8 laws were considered, from which 3 are national and 5 are regional, covering from 1985 to 2021. Except 1, all of them relate to historic, cultural and natural value. The exception addresses the Galician territorial management, and its transversal to all type of urban intervention. The legislative framework was systematised according to the primary values addressed by each regulation, distinguishing between

cultural heritage protection, natural heritage conservation, landscape protection, and territorial planning instruments (Table 1).

Table 1. Primary legislative framework, 1985–2021 (historical and currently applicable).

Law Mentioned in the Text (UK English)	Scope	Main Protection Focus
Law 16/1985 on Spanish Historical Heritage	National	Historical and cultural heritage
Law 8/1995 on the Cultural Heritage of Galicia	Regional	Cultural heritage
Law 3/1996 on the Pilgrims' Routes to Santiago (Caminos de Santiago)	Regional	Cultural landscape/cultural routes
Law 42/2007 on Natural Heritage and Biodiversity	National	Natural heritage and biodiversity
Law 7/2008 on the Protection of the Landscape of Galicia	Regional	Landscape protection
Law 33/2015 amending Law 42/2007 on Natural Heritage and Biodiversity	National	Natural heritage (amendment)
Law 5/2019 on the Natural Heritage and Biodiversity of Galicia	Regional	Natural heritage and biodiversity
Law 1/2021 on Territorial Planning in Galicia	Regional	Land-use and territorial planning

3. Identification of Structural Transformations and Systematization of the Evolution of the Ulló Saltworks

Within the framework of the Galician Rias, the *Ría de Vigo* stands out as one of the most extensively transformed landscapes due to human intervention. Urbanisation has progressively extended along the entire coastal margin, from the mouth of the Verdugo River at the head of the estuary to the Cíes Islands, which enclose and protect the estuary from the Atlantic Ocean [26].

From a geomorphological perspective, the origins of this landscape date back to the end of the last glacial period, when the subsequent flooding of the fluvial valley generated a landscape enclosed between multiple mountain ranges to the north and south [27].

Anthropogenic alterations have occurred continuously from prehistoric times to the present, driven by both productive activities and the expansion of settlements and built infrastructure [28]. Archaeological studies indicate that early human activity shaped the local environment, with specific sites documented in the PXOM of Pontevedra plans. These findings offer insights into the origins of settlement patterns and the long-term relationship between humans and the coastal landscape [29].

The main categories of human-induced landscape transformation are outlined below:

(a) Coastal urbanisation: Archaeological evidence indicates early human presence along the Ría de Vigo, with evidences of occupation dating back to 5000 BC [30]. These have gradually contributed to the structuring of the coastal environment.
(b) Infrastructure development: The earliest major infrastructures were communication routes, established from the Roman period onwards [31]. Over time, maritime infill and port constructions were added to facilitate access to the sea.
(c) Productive and extractive activities: The exploitation of natural resources, including the Ulló saltworks, has been a key driver of landscape modification.
(d) Deforestation and agricultural expansion: Cycles of forest clearance, agricultural use, and subsequent abandonment have altered the local terrain, increasing sediment runoff into the sea and contributing to the formation of estuaries and saltmarshes.

The evolutionary trajectory of the *Ría de Vigo* can thus be structured into distinct phases, reflecting the interplay between natural processes and human interventions (Table 2). This

systematisation not only documents the transformative processes but also identifies critical moments in which human-environment interactions reshaped the landscape [32]. Understanding these phases provides essential guidance for policymakers and conservationists seeking to balance the preservation of the Vigo Ria's natural and cultural heritage with ongoing socio-economic development [30].

Table 2. Chronology of Landscape Transformations at the Ulló Saltworks.

Stage	Period	Key Intervention/Event	Landscape Impact
1	before 1694	Pre-Anthropogenic State	Untouched estuarine landscape, baseline morphology
2	1694–1695	Initial earth embankment	Hydraulic manipulation, brine retention begins
3	1695–1727	Northern and western embankments; active salt exploitation	Establishment of functional saltworks, intensive landscape modification
4	1727–1870	Abandonment; conversion to As Casas farm	Partial integration into agricultural landscape; reduced hydraulic use
5	1870–1990	Southern dyke, tidal mill and territorial reconfiguration	Hybridisation of hydraulic and mechanical systems; renewed landscape activity
6	1990–2025	Contemporary infrastructure and interventions	Stabilisation of structures; heritage valorisation
7	2025–2100	Climate change scenario	Projected sea-level rise and tidal impacts; potential vulnerability of saltworks

At a local scale, the Ulló Saltworks have undergone a series of landscape transformations throughout their history, forming an additive process, yet whose ultimate trajectory appears to be a persistent reversion towards the natural state. The dynamic interplay between natural tidal regimes, human engineering, and socio-economic utilisation has produced a cultural landscape of remarkable complexity, where structural interventions have intermittently modified the estuarine environment while leaving traces of the original morphology. These successive modifications reflect both adaptive strategies to environmental conditions and evolving technological and economic imperatives in salt production.

The earliest identifiable stage corresponds to the natural state of the site during the early Middle Ages, prior to significant anthropogenic interventions, which persisted until the sixteenth century. The first major alteration occurred with the construction of the initial earth embankment in 1694–1695, signalling a deliberate manipulation of hydrological flows to facilitate controlled brine retention [33]. Subsequently, the construction of the northern and western embankments, alongside active salt exploitation between 1695 and 1727, established the functional core of the saltworks, marking a period of intensive landscape transformation and economic activity [34].

Following this productive phase, the site experienced abandonment and partial repurposing as the As Casas farm from 1727 to 1880, during which the previous hydraulic structures were gradually integrated into agricultural uses. Later interventions included the construction of the southern embankment and the installation of a tidal mill (1880–1980), which exemplified the continued hybridisation of natural and engineered elements within the estuarine landscape. Aerial surveys conducted in 1956 and 1980 provided valuable documentation of these changes, supporting subsequent conservation and reinterpretation efforts.

From 1980 onwards, contemporary infrastructures and restorative interventions sought to stabilise the saltworks while preserving both its historical and environmental values. Looking forward, the projected impacts of climate change on sea level and tidal dynamics (2025–2100) present new challenges for the preservation of this highly vulnerable

coastal cultural landscape. Understanding these layered transformations provides a critical framework for managing heritage landscapes that are simultaneously ecological, economic, and cultural in nature.

3.1. Pre-Anthropogenic State (Before 1694)

The natural configuration of the landscape corresponds to the estuarine convergence of the *Villil* and *Tuimil* waterstreams, directly associated with the coastal dynamics of the area and the formation of potential sandbanks [35]. The extent of saltmarsh vegetation was likely considerably more restricted than at present, confined to the initial metres of the coastal fringe and shaped by tidal fluctuations and sedimentary processes typical of low-energy estuarine environments [36]. During the Roman period, *Vía Romana XIX* is documented nearby, running north of the area under study [37]. Recently several Roman settlements have been identified in the vicinity, reinforcing the economic relevance of the local connectivity between *Tude* (Tui) and *Turoqua* (Pontevedra), thereby situating the Ria landscape of Galicia within broader territorial networks of mobility and exchange [38].

However, the earliest written reference to the Ulló Saltworks derives from the transfer of land to the Jesuit Order of Pontevedra, offered as compensation for the construction of a college in the city. This institutional initiative followed the 1655 testament of Licenciado Jorge de Andrade, a priest residing in *Ciudad de Los Reyes* (Peru). In response to this bequest, the family of Don Antonio Mosquera Villar y Pimentel, Knight of the Order of Alcántara and General Administrator, on behalf of the Crown, of the Saltworks of the Kingdom of Galicia, and his wife, Doña Antonia Pimentel de Sotomayor, contributed the lands of Ulló, identified as the *zonas del Ulló* within the parish (*Feligresía*) of *San Martín de Vilaboa*. These lands were ceded explicitly for the establishment and operation of salt-production facilities [39].

Documentary records provide the only known evidence of human occupation prior to the seventeenth century, citing a defensive watchtower located on the northern elevation, *Monte Raxado*, and a fortification to the southeast on *A Cerca*, which controlled access to the bay. The presence of these structures is further supported by toponymic traces, indicating a strategic use of elevated points to oversee maritime circulation and safeguard the inlet [40].

On 14 July 1694, the rector of the Jesuit College of Pontevedra formally assumed possession of the property, delineating its limits by means of a sequence of access points extending from *Porta a Muíños* to *Punta de Agüeiros* [39]. This act of territorial definition constitutes the first explicit demarcation of the site's administrative boundaries.

The characterisation of the pre-seventeenth-century landscape reveals a territory shaped primarily by natural estuarine dynamics, with limited and strategically oriented human occupation. The convergence of hydrological systems, early mobility infrastructures and incipient defensive structures establishes a foundational geography upon which subsequent phases of landscape transformation, particularly those associated with salt production, would later be superimposed.

3.2. Initial Earth Embankment (1694–1695)

Existing documentation indicates that the first constructed elements in the area comprised the western access dyke on land, together with a set of small, isolated buildings located on the site where the farmstead would later be established [41]. These structures were complemented by a perimeter enclosure built in stone, marking an initial and deliberate act of territorial consolidation. Such interventions represent the earliest known attempts to stabilise the terrain, regulate water flows and create the basic infrastructural framework upon which subsequent productive activities, particularly those associated with salt extraction, would be developed.

By this period, the southern fortification at *A Cerca* had already fallen into disuse. Although the precise history of the structure remains uncertain, several accounts record its occupation by groups engaged in acts of pillage, who took advantage of its strategic position near *Vía XIX* and the surrounding maritime routes to conduct raids and other forms of illicit activity. This pattern of opportunistic appropriation reflects the broader vulnerabilities of sparsely controlled coastal landscapes during the transition from the late medieval to the early modern period [42].

In synthesis, this stage marks the initial shift from a predominantly natural landscape to one undergoing intentional human modification. The construction of hydraulic and architectural elements, combined with the progressive abandonment of earlier defensive structures, illustrates a reorientation of territorial functions: from surveillance and protection towards productive exploitation and managed occupation. This juncture therefore establishes the structural foundations for the organised anthropogenic transformation that would define the subsequent evolution of Ulló.

3.3. Northern and Western Embankments and Salt Exploitation (1695–1727)

The period between 1695 and 1727 corresponds to the most intensive phase of anthropogenic reconfiguration of the landscape. In 1695, the principal stone dyke was constructed, forming the northern boundary of the saltworks known as *San Ignacio de la Cruz*. This structure was anchored at both ends to the adjacent hills, thereby creating a stable and continuous barrier capable of controlling tidal inflow and regulating saline water levels across the newly delimited production area.

A second stone dyke, built between 1694 and 1695, subsequently enclosed the saltworks of *San José*. The completion of this hydraulic infrastructure marked a significant technical milestone, enabling systematic management of saline waters and providing the necessary conditions for large-scale salt production, following the full operational consolidation of the dyke system, until 1727 [13].

At the extremities of the hydraulic complex, two *alfolíes* (salt warehouses) were erected. The northern warehouse, considered the earliest, was constructed in stone, while its southern counterpart was built in timber. These buildings functioned as essential components of the production chain, supporting storage, processing and the organisation of labour associated with salt extraction [42].

This phase represents the culmination of deliberate landscape engineering, characterised by the construction of substantial hydraulic and architectural systems that redefined the ecological and spatial dynamics of Ulló. The establishment of dykes, the formal enclosure of productive basins and the erection of specialised storage facilities collectively signify the transition to a fully anthropised landscape, where environmental processes were subordinated to the operational demands of a strategically planned salt-production complex.

3.4. Abandonment and Conversion to as Casas Farm (1727–1870)

This stage extends from 1727 until the construction of a tidal mill on the southern dyke at the end of the nineteenth century. During this period, the ownership of both the saltworks and the *granja* underwent significant change, passing into the hands of the Arana family, who were responsible for erecting the principal structures that remain today. This reorganisation of property holdings resulted in the fragmentation of the former productive unit, thereby undermining the integrated operational capacity that had previously defined the site. As a consequence, the landscape's productive system experienced a progressive and irreversible decline [39].

With the loss of unified management, the saltworks ceased to function as a mining–industrial landscape and were gradually repurposed for agricultural and pastoral uses. This

shift entailed a fundamental reorientation of land use, replacing the precise hydrological and infrastructural regulation required for salt extraction with activities that imposed significantly lower technical demands on the territory. The residual hydraulic structures, increasingly neglected, deteriorated over time, accelerating the functional obsolescence of the former salt-production complex.

In summary, this period marks the transition from a highly specialised productive landscape to a predominantly agrarian one, characterised by the dilution of its former industrial coherence and the gradual degradation of its hydraulic infrastructure. The change in ownership, coupled with the abandonment of salt extraction, initiated a long-term process of landscape decay that would redefine the spatial and functional identity of *Ulló* throughout the eighteenth and nineteenth centuries.

3.5. Southern Dyke, Tidal Mill and Territorial Reconfiguration (1870–1990)

The final productive transformation of the Ulló landscape is associated with the southern dyke and the tidal mill, both attributed to the French engineer Felipe Auguste Cazaux. His name is reflected in the current toponym of the site, *bancas de Casó*. Cazaux was responsible for the construction of the Madrid viaduct in Redondela in 1876 and the international bridge at Tui in 1885, and he owned the house at *Punta do Carregal*, adjacent to the tidal mill [43].

The mill operated for approximately half a century, from around 1870 until 1930. According to Reinoso Maset [42], its mechanism also supplied power to a *fábrica de ropa de aguas* (water-based cloth factory) and, at times, even generated electricity.

Despite the evidences of the dyke or the mill impact, it is important to note the scarcity of information regarding these elements [13]. In particular, it remains unknown whether the two waterwheels located at the eastern end of the dyke were covered, or whether the cloth factory possessed additional infrastructural elements to support its operations [44].

In the 1956 American aerial survey, which is the first record of this type for the region [45], a parcelled landscape can be distinguished, corresponding to agricultural use, within a territory showing limited industrial transformation and minimal infrastructure development. The most prominent feature is the railway line between Arcade and Pontevedra, located to the east.

The sparse vegetation also allows the location of the *As Casas* Farm to be inferred, appearing as a clearing within the woodland; even the shadows reveal the differences in elevation between this area and the saltmarsh to the north. The aerial photograph from the 1980s, the Interministerial Survey, further illustrates the extent of abandonment, with visible signs of vegetation encroachment, the dissolution of the original parcel structure, and the gradual increase in dispersed built-up areas.

Moreover, the same aerial survey captures the construction works of the Autopista del Atlántico (AP-9), situated 600 m from the site, reflecting the significant economic activity taking place in Galicia during that decade.

Taken together, these developments illustrate the final stage in the long process of landscape transformation at Ulló, in which the remnants of nineteenth-century hydraulic and industrial ingenuity coexist with clear signs of twentieth-century decline and territorial reconfiguration. The limited documentation on the tidal mill and southern dyke, combined with the progressive agricultural repurposing, infrastructural encroachment and subsequent abandonment visible in mid- and late-century aerial imagery, reveals a landscape in transition: one where former productive logic has been gradually eroded, giving way to new spatial dynamics shaped by infrastructural modernisation, vegetation succession and diffuse patterns of settlement [30].

In summary, this phase represents the last significant productive reconfiguration of the *Ulló* landscape, combining hydraulic engineering and industrial function within a singular, technologically advanced intervention. The integration of the tidal mill and the southern dyke demonstrates a shift toward mechanised exploitation, while the lack of detailed documentation highlights the need for further research to fully understand the operational and architectural characteristics of these late-nineteenth and early-twentieth-century infrastructures.

3.6. Contemporary Infrastructure and Interventions (1990–2025)

The most recent intervention documented within the study area concerns the creation of a new seafront promenade to the east of the largest saltmarsh, executed by the National Service of Coasts [46]. The 2002 aerial imagery reveals the opening of a compacted-earth track extending from the existing road located on the northern dike towards the *Casó* estate, continuing along the coastal edge of *A Cerca*.

Between 2014 and 2017, the trees growing on the central masonry dike were removed. Their root systems had begun to compromise the structural integrity of the dike, accelerating its deterioration and posing a risk to its long-term stability.

In the final decades of the twentieth century, the most significant landscape transformations were driven both by the introduction of major infrastructures—such as the Atlantic Motorway (AP-9)—and by the consolidation of *O Toural* as the central settlement of the municipality of Vilaboa, accompanied by the dispersed construction of new housing throughout the surrounding area.

The productive sector also shaped the evolving landscape, exemplified by the canning industry, for which the *Muelle Dos Caralletes* was built, clearly visible from the tidal mill.

In the twenty-first century, landscape transformation has continued apace with the implementation of major transport infrastructures, including the high-speed rail line connecting Vigo and Pontevedra, as well as the construction and opening of the new A-57.

Overall, the study area has undergone sustained and multifaceted transformation, driven by the expansion of transport infrastructure, the consolidation of residential nuclei, and sector-specific industrial developments. These interventions, both protective and developmental, have collectively reshaped the coastal and peri-urban landscape, reinforcing the constant interplay between environmental conservation and territorial modernisation.

3.7. Climate-Change Scenario (2025–2100)

Although the principal anthropogenic transformations of the twenty-first century have been the development of major infrastructures and the consolidation of settlement nuclei such as *O Toural* and Arcade, one of the most profound and already tangible drivers of change in the area is climate change.

A clear example of its effects occurred during the spring tides of 19 September 2024. At their peak, water levels exceeded 4 m at multiple points along the Galician coast, including the Vigo–Pontevedra estuarine sector (≈4.2 m), overtopping the Ulló dikes and recreating a landscape reminiscent of the pre-anthropogenic configuration of the site.

Looking ahead, projected sea-level rise and increasing average temperatures suggest that existing heritage assets may experience accelerated deterioration, surpassing current rates of degradation.

In this context, climate change has emerged as a transformative force of equal or greater significance than infrastructural development in the study area. Recent extreme tidal events highlight the increasing exposure of coastal systems, while future climatic trends are expected to intensify the vulnerability of both natural and cultural heritage [7].

The third frame of Figure 3 presents a cartographic simulation for the year 2100, conceived as a scenario-based interpretative map rather than a deterministic forecast. The simulation integrates official municipal and regional cartographic datasets, in DWG and GIS format, with projected sea-level thresholds derived from MeteoGalicia reports and land-use dynamics defined in the PXOM, establishing a coherent long-term spatial framework. The resulting representation combines climatic drivers with social and territorial trends, following a methodological approach consistent with previous historical and prospective landscape reconstructions.

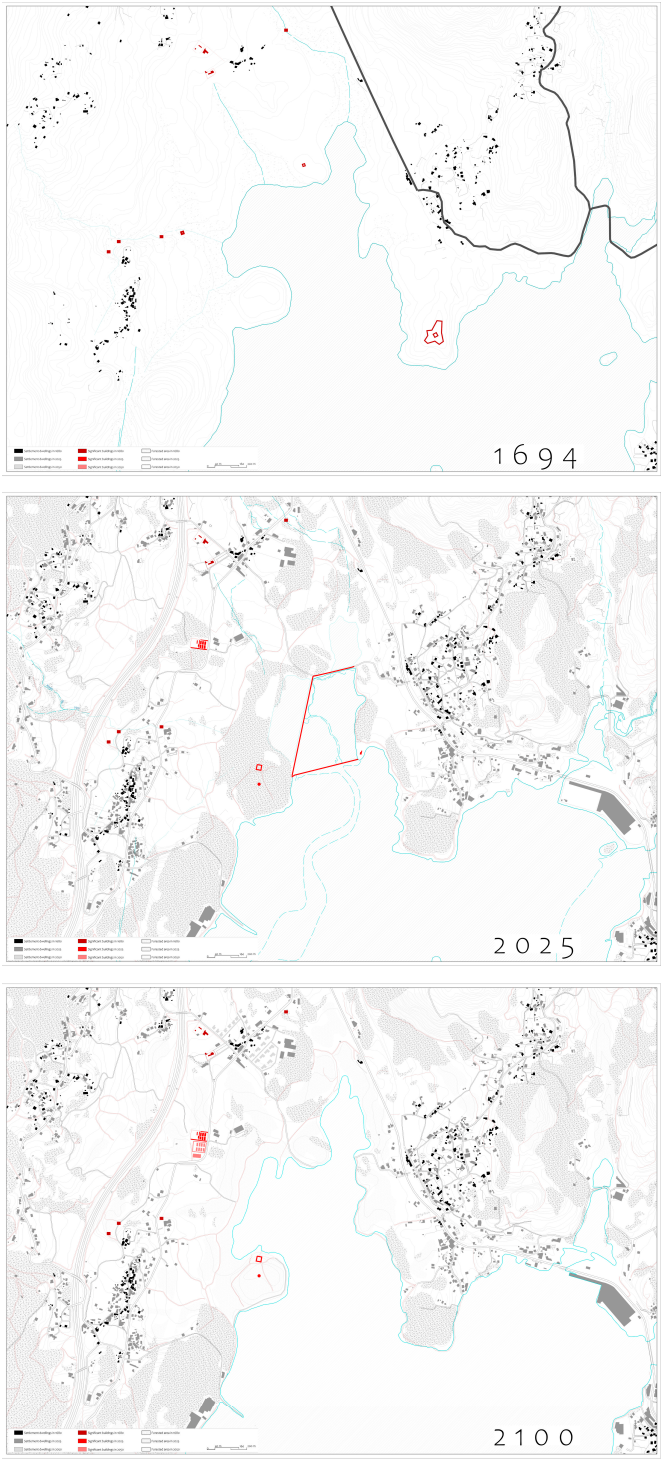

Figure 3. Cartography simulations interpreting the territorial transformation operated between major chronologic parameters (1694–2025–2100).

Within this framework, several anticipated transformations are depicted. A coastal path currently under planning to the south of A Granja, along Monte Rañado, is represented as a potential new linear infrastructure. In parallel, the progressive abandonment of agricultural land is assumed, leading to the expansion of eucalyptus woodland around the perimeter of the salt pans, with associated ecological degradation. Finally, in accordance with the PXOM [29], the settlement of O Toural is shown expanding both northwards and southwards, reinforcing existing patterns of peri-urban growth.

4. Cultural Landscape Protection in Galicia

The protection of the cultural landscape in Galicia is supported by a comprehensive legal framework, encompassing international agreements, as well as national and regional legislation. At the international level, the European Landscape Convention [47] out as a key instrument promoting the protection, management, and integrated planning of landscapes. This perspective is further reinforced by UNESCO's approach to cultural and natural landscapes, particularly through the concept of Biosphere Reserves as learning sites for sustainable development, where the interaction between cultural practices, natural systems, and local communities is explicitly recognised [48].

At the national level, the Spanish Historical Heritage Act [49] already foresaw the protection of culturally significant sites, defining categories such as historic sites associated with historical events, traditions, or past cultural creations. This cultural approach is complemented by environmental legislation, notably the Spanish Natural Heritage and Biodiversity Act [50], later amended by Law 33/2015 [51], which introduces an integrated vision of natural and cultural heritage, emphasizing landscape as a key element of territorial cohesion, sustainability, and environmental quality.

In Galicia, this legal framework is reinforced by the Galician Cultural Heritage Act, which serves as the cornerstone of regional legislation on this matter [52]. This law is complemented by specific regulations, such as Law 3/1996 on the Camino de Santiago, which regulates the cultural and landscape protection of this historic route [53], and the Galician Landscape Protection Act, which introduces a cross-cutting approach to landscape management [54]. These regulatory provisions are further supplemented by environmental and urban planning laws at the regional level, including nature conservation and territorial planning regulations that integrate landscape-related criteria [55].

In recent decades, significant legislative changes have taken place. Until the 1990s, cultural landscape protection was primarily addressed through traditional heritage categories—monuments, historic ensembles and historic sites—and through specific measures targeting particular environments, including early national protection decrees affecting the Camino de Santiago and the subsequent Galician Act of 1996 safeguarding this historic route [53]. Since the 2000s, international influence, especially UNESCO's recognition of cultural landscapes and the implementation of the European Landscape Convention, has encouraged a broader approach to territorial protection [56].

In response to this evolution, Galicia enacted a specific landscape law in 2008, integrating cultural, environmental, and urban dimensions into territorial planning [54]. Simultaneously, heritage laws in various Spanish regions, including Galicia, began incorporating new protection categories—such as cultural landscapes, historic routes, and cultural parks, recognising environments shaped by the interaction between nature and human history [57]. This legislative shift reflects the transition from the isolated protection of monuments to a more holistic approach to landscape as heritage.

4.1. Integration of Green Infrastructure into Territorial Planning

Alongside this transformation in landscape management, territorial and environmental planning in Spain has increasingly incorporated approaches aimed at ensuring ecological connectivity and ecosystem sustainability. The approval of the Natural Heritage and Biodiversity Act (Law 42/2007) marked a milestone in integrating the concept of green infrastructure into national legislation [50]. The 2015 amendment further strengthened this principle [51] by establishing the obligation to develop a National Green Infrastructure, Connectivity, and Ecological Restoration Strategy (ENIVCRE).

This strategy, aimed at consolidating a network of functional natural and semi-natural spaces by 2050, is coordinated with regional governments through the State Commission for Natural Heritage and Biodiversity, ensuring a structured planning approach that integrates cultural landscape protection with ecological restoration and territorial connectivity [58].

Within this framework, Galicia has developed its own regulatory approach through the Natural Heritage and Biodiversity Act [55] and the Territorial Planning Act [59], aligning regional policies with national and European guidelines on conservation and ecological restoration. Law 5/2019 establishes, in Chapter VIII, the obligation to develop a Galician Green Infrastructure, Connectivity, and Ecological Restoration Strategy, ensuring coordination across administrative levels and coherence in the management of ecological corridors and key landscape elements.

The Territorial Planning Act reinforces this regulatory framework by defining green infrastructure as a fundamental territorial system, ensuring its integration into spatial-planning instruments as presented in Figure 4 [59]. This legislation highlights the importance of preserving ecological connectivity and ecosystem services in both urban and rural environments, promoting sustainable territorial planning that prevents fragmentation and environmental degradation.

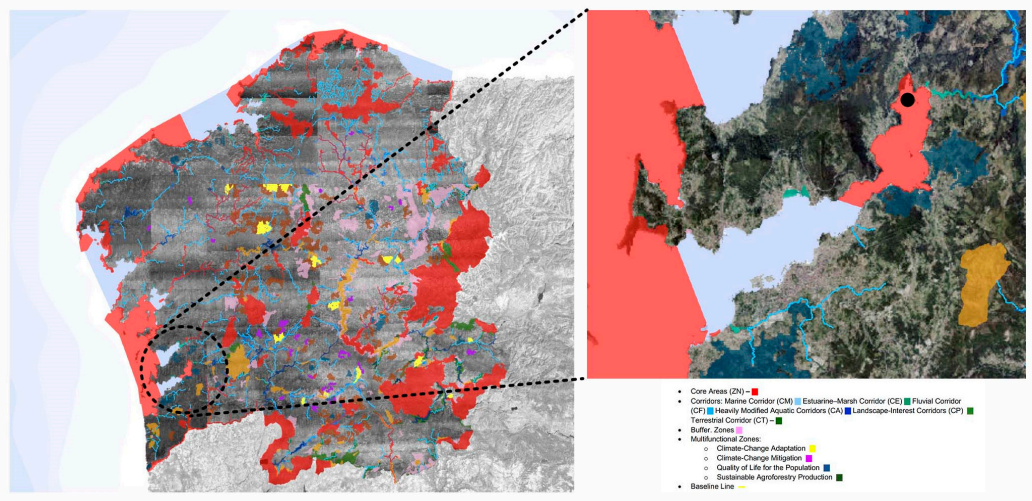

Figure 4. Territorial Elements and Configuration of the Green Infrastructure of Galicia (Regional Level).

4.2. Implementation and Prioritisation of Green Infrastructure in Galicia

The Galician Green Infrastructure Strategy is designed to be implemented at multiple scales, prioritising planning in major urban and peri-urban systems, where enhancing connectivity and sustainability objectives is essential. To support this process, the Scientific-Technical Bases for the Establishment of Green Infrastructure in Galicia [58] provide key information for configuring local-scale green infrastructure.

At a subregional level, the strategy focuses on multi-municipal areas and identifies Biosphere Reserves as an appropriate model for implementation, as they already incorporate zoning systems and participatory governance mechanisms [48]. In addition, the

inclusion of neighbouring municipalities with similar environmental and socio-economic characteristics is proposed in order to ensure a more integrated and effective restoration and connectivity strategy across Galicia.

4.3. Priority Areas

As part of the Galician Green Infrastructure Strategy, specific Priority Areas for Ecological Restoration (PARE) have been identified, focusing on the recovery of degraded habitats and the mitigation of invasive species. According to the Scientific-Technical Bases [58], the conservation status of protected species and habitats of Community interest in the Atlantic biogeographical region is predominantly unfavourable, highlighting the urgency of restoration measures.

At the regional level, 293 locations have been identified as priority restoration areas, grouped into three main categories:

1. Coastal areas
2. Fluvial corridors
3. Interior valleys and mountain systems

These areas were selected through scientific studies and public-participation processes and require detailed intervention plans, including habitat restoration, hydro-ecological recovery, public-use impact management and control of invasive species.

Within this ecological restoration framework, the Ulló Saltworks (*Salinas de Ulló*) have been identified as a Priority Area for Ecological Restoration (PO-031) in the Galician Green Infrastructure Strategy. This classification entails the implementation of specific measures for restoring its structure, composition, and ecological functionality. Restoration interventions must focus on terrestrial habitat recovery, hydro-ecological restoration, public-use impact control, and invasive species management, ensuring improved ecological connectivity and the regeneration of degraded natural processes, in accordance with management instruments and existing sectoral regulations [58].

Table 3 presents the officially designated Priority Areas for Ecological Restoration (PARE) established within the Galician Green Infrastructure Strategy. Each site is assigned a restoration code (01–05), which identifies the specific type of ecological intervention required: 01—Terrestrial habitat restoration, 02—Hydro-ecological restoration, 03—Control of invasive species, 04—Public-use impact management, and 05—Measures to reinforce ecological connectivity. These categories guide the design of restoration plans according to the ecological condition and restoration needs of each area.

Table 3. Priority Areas for Ecological Restoration (PARE) in Galicia.

Ecological Restoration Priority Areas	Code	1	2	3	4	5
Tourón Mine	OU_015				•	
Carballeda de Avia Mine	OU_016				•	
Pena Corneira Mines	OU_017				•	
Río Limia	OU_018	•	•	•	•	•
Pena Trevinca SAC	OU_019	•				
Rubía Mine	OU_020				•	
Xagoaza Mine	OU_021				•	
O Barco Industrial Area	OU_022	•		•		•
San Vicente Mine	OU_023					•
Regueiro Teixeira Mine	OU_024					•

Table 3. *Cont.*

Ecological Restoration Priority Areas	Code	1	2	3	4	5
Penouta Mine	OU_025					●
Praia do Bao	PO_001		●	●	●	●
Punta Carreirón	PO_002	●	●	●		●
Praia Area da Secada	PO_003			●		●
Illote Areoso	PO_004					●
Umia Estuary	PO_005		●		●	
Illa da Toxa	PO_006	●	●	●	●	●
A Lanzada	PO_007	●		●	●	●
O Grove	PO_008	●		●	●	●
Sanxenxo Coast	PO_009	●	●	●	●	●
Cabo Udra SAC	PO_010			●		●
Praia Areabrava	PO_011			●	●	
Costa da Vela SAC	PO_012	●		●	●	●
A Ramallosa SAC	PO_013	●	●	●	●	●
Cabo Silleiro	PO_014			●	●	●
Baixo Miño SAC	PO_015	●	●	●	●	●
Cortegada Island	PO_016	●			●	
Ons Archipelago	PO_017		●	●	●	
Cíes Archipelago	PO_018	●	●	●	●	●
AG-57 Highway	PO_019			●	●	
Monte Alba	PO_020	●		●	●	●
Monte Aloia Natural Park	PO_021	●	●	●	●	●
Ulla-Deza River System SAC	PO_022	●	●	●	●	●
Breañas de Xestoso SAC	PO_023	●		●		●
Xunqueira de Alba	PO_024	●	●	●	●	●
Río Lérez SAC	PO_025	●	●	●	●	
Gándaras de Budiño SAC	PO_026	●	●	●	●	
Monte Castrove	PO_027			●		●
Torres do Oeste	PO_028					●
Monte Xiabre	PO_029	●			●	●
Río Verdugo	PO_030	●			●	
Salinas de Ulló	**PO_031**		●		●	
Serra do Galiñeiro	PO_032	●	●	●	●	●
Serra da Groba	PO_033	●	●	●	●	●
Porriño Quarries	PO_034		●	●	●	
Salvaterra de Miño Industrial Area	PO_035	●	●	●	●	
Río Tea	PO_036			●	●	
Río Louro	PO_037	●		●	●	
Río Miño 06	PO_038	●			●	

Table 3. *Cont.*

Ecological Restoration Priority Areas	Code	1	2	3	4	5
Serra do Suído	PO_039		•	•		
Outeiro da Porca Mine	PO_040				•	
Meis Mines	PO_041			•		
Montes de Xinzo Mines	PO_042				•	
Prado Mine	PO_043			•		

5. The Legal Framework of the Ulló Saltworks

The Ulló Saltworks complex, including the saltworks, the tide mil and the farm, as listed in the Catalogue of the Plan Básico Autonómico de Galicia (PBA), is subject to a dual system of environmental and cultural protection. The PBA, approved by Decree 83/2018, constitutes the mandatory baseline spatial-planning instrument for the entire territory of Galicia and establishes uniform territorial criteria, including a binding Catalogue of Cultural Heritage applicable to all municipal and sectoral planning instruments.

Environmentally, the site lies within the Special Area of Conservation (SAC) "Enseada de San Simón" (ES1140016), designated under the EU Habitats Directive and formally approved by Decree 37/2014 of the Xunta de Galicia [60], which also sets out the management provisions for the Galician Natura 2000 Network. As part of this SAC, the saltworks are embedded in a protected estuarine landscape composed of intertidal habitats, saltmarsh communities and significant birdlife, falling under the legal regime of the Galician Natural Heritage and Biodiversity Act [55]. This framework requires strict conservation of ecological values, restricts land-use transformations and mandates prior environmental authorisation for any intervention.

From a cultural-heritage perspective, both the tidal mill and the salt-production structures are included in the PBA Catalogue of Cultural Heritage. This catalogue operates within the framework of the Galician Cultural Heritage Act (Law 5/2016) [61], which establishes binding protection categories to be applied in spatial planning at all scales. Although the Ulló Saltworks ensemble has not been formally declared a Bien de Interés Cultural (BIC), its inclusion in the PBA Catalogue confers immediate legal protection [62]. The 2016 Act explicitly recognises traditional hydraulic infrastructures, including tidal mills, and ethnographic production systems as protected heritage assets, providing a solid legal basis for safeguarding the site.

6. Revising the Legal Framework of the Ulló Saltworks

The current legal framework governing the Ulló Saltworks reveals a pronounced imbalance between the breadth of environmental protection and the fragmentation of cultural-heritage safeguards. As outlined above, the site benefits from robust ecological protection through its designation as the Natura 2000 Special Area of Conservation "Enseada de San Simón" [60] and its identification as a Priority Area for Ecological Restoration (PO-031) within the Galician Green Infrastructure Strategy, which mandates habitat recovery, hydro-ecological restoration and connectivity enhancement. In contrast, cultural protection remains limited to the individual listing of the tide mil (*Muíño de Mareas das Salinas de Ulló*), the farm (*Granxa*) and the saltworks of Ulló (*Salinas de Ulló*) and associated structures in the Catalogue of the Plan Básico Autonómico [62], without recognising the saltworks as a unified industrial ensemble or cultural landscape.

This disjunction contrasts with the conceptual and legal instruments already available in the Galician Cultural Heritage Act [61], which provides broader protection categories—

historic ensemble, historic site and cultural landscape—intended to safeguard coherent territorial systems shaped by sustained interactions between human activity and the environment. While individual listing may be adequate for discrete monuments, it is insufficient for a pre-industrial salt landscape whose material, functional and symbolic values emerge precisely from the interdependence of ponds, embankments, hydraulic infrastructures, agricultural outbuildings and the estuarine environment. Treating these components as isolated artefacts dilutes their industrial unity and weakens the basis for integrated management [63,64].

A comparative analysis of other Spanish saltworks with higher levels of protection reinforces this conclusion. The Valle Salado de Añana (Álava) has been designated as a Bien Cultural in the category of Conjunto Monumental—a heritage designation protecting an integrated architectural or industrial ensemble—and is explicitly recognised as a cultural landscape in the Inventory of Basque Cultural Heritage [65,66]. This designation covers both the historic core and associated archaeological zones under a single protection perimeter and regulatory framework. Similarly, the *Conjunto Las Salinas* in *Arcos de las Salinas* (Teruel) has been declared a Bien de Interés Cultural in the category of Lugar de Interés Etnográfico, acknowledging the indivisible character of its hydraulic, architectural and productive system [67]. The *Salinas de Arinaga* (Gran Canaria) is likewise protected as a Bien de Interés Cultural, Spain's highest heritage-protection category, within a broader coastal salting complex where geomorphological and climatic conditions are considered inherent to heritage value [68]. Across these cases, saltworks are not reduced to isolated elements but are legally framed as unitary industrial landscapes in which heritage, landscape structure and ecological functions are jointly regulated.

Spanish experience also demonstrates that ensemble-based heritage protection can coexist with, and indeed be reinforced by, environmental designations. The *Ses Salines d'Eivissa i Formentera* Natural Park, for example, is managed as a protected area of exceptional ecological, landscape, historical and cultural value, where conservation policies address biodiversity, traditional salt-production infrastructures and associated cultural practices in an integrated manner [69,70]. This approach is highly relevant to Ulló, where Natura 2000 status provides ecological protection but does not articulate a cultural-landscape strategy capable of guiding active conservation, adaptive reuse and public interpretation.

In the specific case of the Ulló Saltworks, the absence of ensemble or cultural-landscape designation has at least three critical implications. First, it prevents recognition of the site as a coherent industrial system, complicating the justification of interventions that must operate at the scale of the ensemble—such as rehabilitating the entire hydraulic circuit. Second, it restricts archaeological protection to small perimeters around individually listed items, despite documentary and cartographic evidence indicating significant subsurface and intertidal archaeological potential [71]. Third, it fails to address pressing climate-change risks, including sea-level rise and storm-surge impacts, as highlighted by the 2024 spring tides, which temporarily overtopped the dikes and recreated quasi-natural flooding conditions [59,72,73].

On this basis, legislative reform for the Ulló Saltworks should prioritise reclassifying the site from a fragmented set of protected elements to a single protected industrial cultural landscape as presented in Figure 5. Several lines of action can be proposed:

1. initiating a formal procedure under Lei 5/2016 to declare the Ulló Saltworks a historic ensemble or cultural landscape, encompassing the full hydraulic system, productive structures and estuarine context;
2. extending archaeological safeguards to a continuous terrestrial and intertidal reserve area aligned with documented historical and archaeological potential;

3. integrating cultural-heritage objectives explicitly into the management instruments of the SAC "Enseada de San Simón" and the PO-031 ecological-restoration area;
4. incorporating climate-adaptation requirements into binding regulations, including systematic tidal-impact monitoring, stability assessment of dikes under sea-level-rise scenarios and the development of reversible protective measures.

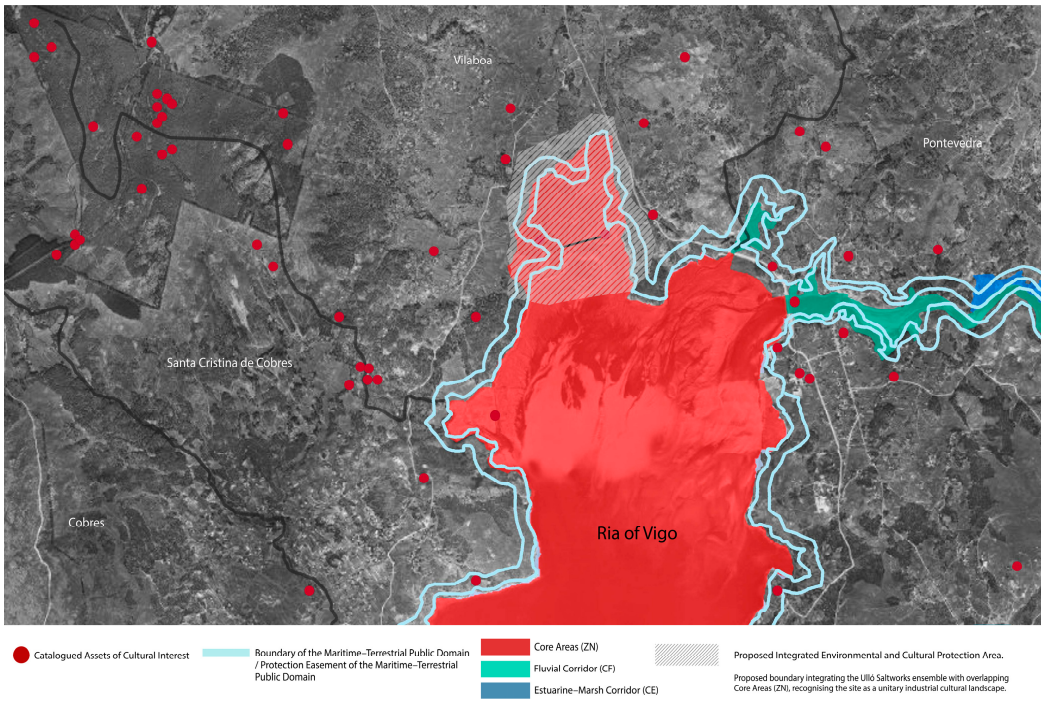

Figure 5. Representation of the proposed Integrated Environmental and Cultural Protection Area.

These proposals require no new legal categories; instead, they activate existing instruments in a more coherent and site-specific manner. Transitioning from isolated listings to a unified industrial cultural landscape would strengthen legal clarity, improve access to funding and enable more robust participatory governance, while laying the groundwork for broader discussions on regulatory innovation and landscape-scale heritage governance [74].

Within a broader European context, these challenges are embedded in current debates on cultural landscapes as living systems, in which heritage conservation, ecological sustainability, and social practices must be addressed in an integrated manner [75]. Recent research has highlighted the need to move beyond static protection frameworks and towards adaptive and participatory models capable of responding to environmental change and socio-economic transformations [76]. This perspective reinforces the relevance of landscape-governance approaches promoted at the European level [77,78].

7. Discussion

The Galician Rias, despite their well-recognised ecological and natural significance, remain insufficiently acknowledged as distinct cultural landscape assets [79]. This omission poses fundamental challenges for integrated heritage and environmental management, particularly in regions such as the Ulló Saltworks, where human intervention and natural dynamics intersect in complex ways. The lack of formal recognition as a cultural landscape limits the application of context-sensitive protective measures and risks reducing management to a reactive rather than proactive strategy.

One of the most pressing issues concerns the convergence of archaeological sensitivity and environmental vulnerability, increasingly exacerbated by climate change. Advances in digital documentation, both subaquatic and terrestrial, have enabled the timely record-

ing of information from features undergoing accelerated degradation [7]. Nevertheless, interventions aimed at artificially stabilising the coastline, primarily to safeguard built heritage and recently developed infrastructure, have, paradoxically, compromised older archaeological deposits, often in a fragile state [80]. This tension underscores a central paradox of heritage management in the region: the necessity of reconciling short-term preservation imperatives with the long-term conservation of irreplaceable historical and pre-industrial elements.

The regulatory framework further complicates this scenario. Instruments such as the Natura 2000 network, transposed into regional legislation, presuppose the existence of assets that fall under comparable categories across Europe. Yet, the mechanisms for safeguarding these assets vary substantially, depending on location and the administrative context [81]. Consequently, sites like the Ulló Saltworks are subject to legal inconsistencies that hinder the development of integrated and coherent management strategies.

Several interrelated constraints shape both the characterisation of the Ulló Saltworks and the effectiveness of the current regulatory framework. The site constitutes a highly heterogeneous landscape, where natural systems, historical infrastructures and pre-industrial productive elements coexist within tightly interwoven terrestrial, intertidal and subaquatic environments. This complexity complicates the definition of coherent spatial boundaries for research, protection and management, while accelerated environmental dynamics are progressively altering coastal morphology (Figure 4), ecological functioning and long-established landscape structures. At the same time, ongoing transformations in traditional agricultural systems, linked to soil salinisation and rising temperatures, are reshaping both land use and the ecological and cultural continuity of the area.

These spatial and environmental challenges are compounded by institutional and regulatory constraints. Fragmented property regimes, embedded in Galicia's cadastral system, hinder coordinated management and long-term stewardship, while existing heritage protection instruments tend to apply uniform categories to structurally diverse assets, reducing their capacity to address site-specific vulnerabilities. Moreover, insufficient coordination between heritage legislation, territorial planning tools and sectoral environmental policies limits the development of integrated conservation strategies. Together, these factors undermine proactive landscape governance and constrain the implementation of adaptive approaches capable of responding to the combined pressures of environmental change and cultural-heritage preservation.

While the present study does not claim to resolve these complex challenges fully, it systematically identifies critical gaps and inconsistencies in the regulatory and environmental frameworks affecting the Ulló saltworks. By highlighting these issues, it provides a foundation for context-sensitive management strategies that reconcile ecological, historical, and cultural imperatives [8]. Ultimately, the case of the Ulló Saltworks underscores the need for adaptive frameworks that are both legally coherent and ecologically informed, capable of supporting the sustainable evolution of culturally significant coastal landscapes in Galicia and, by extension, the wider Mediterranean region. Nevertheless, several limitations of the present study must be acknowledged. The analysis is based on a single case study, which limits the direct transferability of the results to other contexts. In addition, the legal and spatial assessment is not supported by detailed economic evaluations or quantitative modelling of future climate-change scenarios, which would be necessary to assess long-term management feasibility. Furthermore, while institutional and regulatory dimensions are examined in depth, social dynamics and stakeholder perspectives are only indirectly addressed. Future research should therefore integrate socio-economic analyses, participatory approaches and predictive environmental modelling to strengthen landscape-scale governance frameworks for coastal cultural heritage.

8. Conclusions

This paper contributes to debates on coastal cultural landscape protection by demonstrating the limitations of fragmented legal frameworks when applied to complex pre-industrial systems. It integrates historical geography, coastal ecology, heritage cartography and heritage legislation, highlighting the structural disconnect between environmental protection instruments, such as Natura 2000, and cultural-heritage safeguarding. The study proposes a conceptual framework that recognises industrial cultural landscapes as functional territorial units aligned with European landscape-scale governance approaches.

The research emphasises the value of dynamic digital cartography based on multi-temporal geospatial data and interactive visualisation, which improves the interpretation of landscape change and its implications for heritage management. By combining historical sources with digital surveys, this approach supports more robust ecological and cultural assessments and facilitates adaptive management. The paper advances legally feasible measures through the coordinated use of existing instruments, offering a transferable model for the reclassification of historic saltworks and similar coastal systems.

However, as stated in the previous chapter, future research should expand comparative analyses, integrate hydro-sedimentary modelling and predictive cartography, and further examine multi-level governance, participation and fiscal tools for coastal cultural landscapes.

Natura 2000 is one of the legal protection instruments that has most significantly enhanced public awareness of the vulnerability of environmentally sensitive territories in the Iberian Peninsula, particularly coastal habitats and their associated river basins. However, its translation into regional legislation often proves limited, given the heterogeneity of the natural and cultural assets involved and the need to reconcile multiple territorial interests.

The Ulló Saltworks exemplify this complexity. The site, characterised by substantial archaeological potential and a distinctive pre-industrial technological heritage, reflects the asymmetric and discontinuous patterns of development typical of rural Galicia [1], where public infrastructural modernisation was both late and, at times, oversized [82]. In this context, the current regulatory categorisation, although designed to safeguard environmental values, may inadvertently constrain active management approaches and, consequently, accelerate the degradation of its cultural heritage.

At present, in terms of legal heritage protection, the Ulló Saltworks, or more specifically the part of the estuary in which they are located, is subject to the same regulatory framework as the historic centre of any town in the region or a religious built complex, regardless of their state of conservation.

The natural and urban specificity of the *Rías Baixas* demands a sensitive approach based on the integrated articulation of their occupation, exploitation and protection, as a number of authors have recently proposed [80]. The revision of the existing legal framework, in a progressive and structured manner, without compromising the general applicability of the underlying principles to analogous cultural assets, emerges as one of the most urgent challenges [83]. The rapid pace of social change and the technical implementation processes, highly dependent on political decision-making, have favoured a significant mismatch between inevitable landscape transformations and their regulatory mechanisms [25].

The results of this research shows that the Legislative reform for the Ulló Saltworks should prioritise their reclassification as a single protected industrial cultural landscape. Proposed actions include formal designation as a historic ensemble, the extension of continuous archaeological safeguards, and the explicit integration of heritage values into existing environmental management instruments. Climate-adaptation requirements, such as tidal monitoring and dike stability assessments, should also be incorporated. Without creating new legal frameworks, this approach enhances regulatory coherence, access to funding, and participatory governance.

The context of coastal heritage in the Rias (Iberian coastal lagoons), interweaving environmental valorisation with the built environment, and historical with pre-industrial heritage, constitutes an exceptional testing ground for a critical redefinition of landscape protection in Europe, as well as a means of supporting territorial evolution more attuned to its cultural identity [84].

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