

Heritage and Community. Strategies for a sustainable change of the mid-Adriatic coastline

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Abstract

The study analyzes the coastal landscape of the mid-Adriatic coast of Abruzzo, from Pineto to Vasto, interpreting the heritage processes connected to the dynamics of territorial transformation. The focus is on new forms of development aimed at enhancing the coastal heritage, understood as an accessible resource.

The research deals with heterogeneous territories: the Adriatic city, squeezed between the coastline and the infrastructure that crosses the Adriatic dorsal of the country, and the Costa dei Trabocchi, where the rural landscape clashes with the pressures of urbanization and tourism.

The coastal heritage, consolidated and in need of reinterpretation, is understood here as an environmental infrastructure and a laboratory for experimenting with policies to mitigate the risks posed by climate and social change, capable of developing sustainable enhancement strategies.

Keywords: Trabocchi coast, tangible and intangible heritage, heritage community, mid-Adriatic coastline, Coastal Landscape.

Introduction

The coastal areas of the Mediterranean are currently undergoing profound environmental, social, and territorial transformations, triggered by intense urbanization, climate change, and increasing pressure from tourism.

In this scenario, the stretch of the mid-Adriatic coast of Abruzzo between Pineto and Vasto represents an emblematic laboratory for investigating the tensions between development and conservation, between heritage and innovation. The study focuses on the mid-Adriatic coast of Abruzzo, interpreted as a privileged space of connection between cultures, economies, and emerging territorial dynamics. Abruzzo now plays a strategic role as a gateway to the eastern coast of the Adriatic Sea, strengthening its vocation as a bridge to the Balkan peninsula, which is currently undergoing economic, cultural, and social upheaval.

The study aims to analyze the coastal landscape of the mid-Adriatic coast of Abruzzo, interpreting the processes of heritage preservation linked to the dynamics of transformation currently underway. The goal is to identify new forms of sustainable development capable of protecting and enhancing heritage, understood as a living and shared resource.

The CostaMed research, conducted by the research unit of the University "G. d'Annunzio" Chieti-Pescara, aims to create a cognitive atlas of the mid-Adriatic coastal heritage, focusing on the coastal heritage of Abruzzo to create a territorial analysis tool that can provide a comprehensive picture of the characteristics and potential of this specific geographical area. The research is part of the PRIN 2022 project "COSTA | Med - Catching Opportunities for Strategic Transformation and Adaptation of Mediterranean Coasts," which involves the research units of Roma Tre University and the University "G. d'Annunzio" Chieti-Pescara.

The paper is divided into four main sections. The first section presents the theoretical and methodological context of the research. The second section describes the study area, highlighting the specific characteristics of the Abruzzo coastline between Pineto and Vasto. The third section illustrates the results of the territorial analysis and the atlas as a tool for reading and studying the territory. Finally, the fourth section looks at the impacts of climate change and some good practices.

The Mid-Adriatic between identity and transformation

The Adriatic Sea, with its qualities and history that have defined the characteristics of the peoples inhabiting the territories bathed by its waters, is one of the basins of the Mediterranean Sea that has perhaps contributed most to our understanding of the Mediterranean world, its dynamics, and its events. This is despite the historical complexity of the basin and its “marginal” position, with which we are accustomed to identifying it today.

This basin, defined by Franco Farinelli (2024) as “the sea of domesticated complexity,” encompasses three of the main civilizations of the contemporary world, identified by Samuel P. Huntington: Islamic, Orthodox, and Western civilizations, which together make up the soul of the Adriatic.

The work of the research unit at the University “G. d’Annunzio” Chieti-Pescara fits into this context rich in communities and tangible and intangible heritage, where geographical proximity has fostered processes of exchange, comparison, and cultural hybridization. The activity is developed within the CostaMed project, focusing on the stretch of the mid-Adriatic coast of Abruzzo, along the western coastline.

The macro-context of the research is part of a much larger geographical context that extends for about 400 km, covering an area that stretches from Emilia-Romagna to Molise, crossing the Marche and Abruzzo regions. These regions share similarities in their urban and social characteristics along their coasts, such that the mid-Adriatic can be considered a single territorial entity.

The territory is structured as an urban filament that runs continuously along the entire coastal strip (Pignatti, 2014). In its components, which will be described in more detail below, the mid-Adriatic manifests itself along this strip of land, intersecting perpendicularly with the valleys. These natural, urban, and infrastructural intersections give rise to the characteristics and “situations” that shape the identity of the central Adriatic territory.

This coastal landscape, including the Abruzzo coastline, is a vacation destination par excellence, an identity for which it is famous abroad, generating substantial tourism from Europe. It is characterized by endless rows of beach umbrellas which, like the urban fabric, seem to stretch uninterrupted along the mid-Adriatic coast. This is a tourist image that over time has become a distinctive feature of the mid-Adriatic landscape, an identity that today, however, threatens the very existence of this territory. The Abruzzo coastline under consideration is in fact subject to strong expansionist pressure from tourism, which threatens the territories, the communities that live there, and their tangible and intangible heritage.

Coastal heritage as environmental infrastructure: sustainable development of the mid-Adriatic coast of Abruzzo

The coastal heritage is interpreted here as environmental infrastructure (di Venosa, et al. 2022), alive and dynamic, overcoming the traditional static view to embrace a perspective that recognizes it as an active resource, capable of redefining itself through social practices of enhancement. It thus takes the form of a value-generating resource, through its daily use by the communities that inhabit it, through practices capable of keeping it alive and mitigating the risk factors that threaten its existence.

This dimension is particularly important in the coastal areas of the mid-Adriatic region of Abruzzo, where traditional practices, from fishing along the Trabocchi coast to settlement patterns and relationships with the territory, now constitute an intangible heritage that manifests itself through places and rituals. This is the same heritage that local artists have always represented, such as the painter Francesco Paolo Michetti and the “circolo michettiano” with their evocations of everyday life in Abruzzo.

These testimonies show how heritage in its various forms is articulated in complex relationships between the natural and built environment, knowledge, and traditions, where landmarks such as the trabocchi or the more recent oil and gas extraction platforms take on the value of identity symbols capable of guiding territorial development.

Heritage is constructed through the adoption of social practices of attribution of meaning, a particularly fruitful perspective for coastal heritage, where transformations require a continuous renegotiation of meanings and values. The European Landscape Convention introduces a democratic concept of landscape, defining it as “a specific part of the territory, as perceived by the population” and emphasizing that “landscape is a key element of individual and social well-being.” This link between quality of life and landscape is a fundamental principle, particularly significant for coastal areas where environmental quality is a factor of attractiveness and a resource for the well-being of communities.

Coastal heritage must be seen as a privileged laboratory for policies to combat climate crises, a territory where innovative and sustainable solutions can be tested that effectively integrate heritage protection with contemporary environmental challenges.

The Faro Convention (2005), and in particular its Article 8 on “Environment, heritage, and quality of life,” provides the theoretical and operational framework to support this project vision. The article establishes the importance of using all dimensions of cultural heritage to enrich development processes and promote an integrated approach to policies concerning cultural, biological, and landscape diversity. Heritage enhancement is achieved through the ability to understand the virtuous link between heritage itself, improvement of quality of life, and sustainable development.

The concept of “heritage communities” therefore takes on a central role, identifying groups of people who value specific aspects of cultural heritage and wish to support and pass them on to future generations. This approach does not replace institutional logic, but promotes structured collaboration between public institutions and heritage communities, creating the conditions for participatory governance of coastal heritage that can respond to the needs of conservation as well as those of climate adaptation and sustainable territorial development.

It is important to highlight some fundamental aspects of the Convention that are essential for research and its future developments. The first concerns democratic participation, which provides for the active involvement of communities in decisions relating to the cultural heritage of their territory. This is followed by the integrated approach, according to which heritage protection must be considered across all sectors of public policies, recognizing the strong connection between heritage and development. Finally, shared responsibility establishes that the identification, study, protection, and conservation of cultural heritage do not belong exclusively to institutions but are a collective responsibility of citizens.

To paraphrase Alberto Magnaghi, in this perspective, designing means creating a “stable home”, i.e. establishing virtuous relationships between the settled community, the environment and the territory. Building the future means reconnecting differences, where diversity becomes a resource rather than a source of fragmentation. At the heart of this vision, the community is not just a social aggregation, but becomes the active subject of territorial transformation, capable of imagining and building concrete alternatives.

The prospects for the mid-Adriatic coast of Abruzzo in this research are outlined through the integration of these theoretical dimensions into operational strategies capable of enhancing the existing heritage, orienting transformations towards environmental and social sustainability.

Characteristics of the coastal urban fabric between Pineto and Vasto

The stretch of coast between Pineto and Vasto is an emblematic fragment of the so-called linear Adriatic city, where the urban fabric is continuous along the coastline, intertwining with transport infrastructure and the local landscape. The urban morphology of this area is the result of a predominantly recent and widespread development, in which medium-sized urban centers, such as Pescara, Ortona, and Vasto, alternate with smaller towns.

This sequence of settlements is characterized by a dual nature: on the one hand, heavy anthropization along

the coastline, reflecting a process of urbanization that alternates between residential areas, beach resorts, and tourist infrastructure; on the other hand, a significant presence of agricultural and coastal landscapes, residual green areas, and portions of territory that still reflect a more direct relationship between the community and the natural environment.

The Adriatic sea, defined by Matvejević (2006) as the “sea of intimacy”, has played a crucial cultural role in the formation of these settlements, not only as a route for trade and connection, but as a fundamental element of identity. If we were to look at Europe from above at night, we would immediately notice that “the two coasts of the Adriatic show an irreducible diversity. “On one side, the dense layer of lights” (Bianchetti, C. 2002) that highlight the western part, dotted and illuminated by the conurbation of the linear Adriatic city, and on the other side, “a black border in a Mediterranean full of lights” (Bianchetti, C. 2002). A sort of exception, decipherable from the landscape and history.

The medium-sized western Adriatic cities that dot this coastal strip, often with between 50,000 and 200,000 inhabitants, are now central nodes in the redefinition of sustainable urban development models. According to the reflections of A. Rodríguez-Pose (2018), these cities, once considered “places that do not matter,” are acquiring a new prominence, demonstrating a capacity for resilience and innovation that large metropolises struggle to maintain.

In the section between Pineto and Vasto, the urban fabric significantly expresses the tension between consolidation and transformation. This segment of the so-called linear Adriatic city is a complex landscape, where established infrastructure and new coastal centers intertwine. The Trabocchi coast, with its architecture suspended over the water, coexists with tourist and industrial ports such as those of Pescara and Vasto, while protected areas of nature, such as the Torino di Sangro holm oak forest, offer an ecological counterpoint of great importance. In this scenario, the interaction between settlements, infrastructure, and landscape provides a privileged observatory for interpreting territorial transition processes and imagining a new development paradigm based on the integrated enhancement of cultural, environmental, and built heritage.

The Trabocchi coast: natural landscape and development processes

Along the Adriatic coastline, between land and sea, ancient structures stand out, their roots sinking into the water: the trabocchi, bearers of a deep local history and authentic symbols of the genius loci of the mid-Adriatic. It is no coincidence that the 42 km stretch of coastline between Ortona and Vasto has been named the Trabocchi coast, in recognition of their central role in redefining the collective imagination and the specificity of the Abruzzo region.

These fishing machines on stilts, built entirely of wood and anchored to the rocks by long arms that support the nets, are widespread along the central Adriatic coast and represent a unique architectural and engineering feat, skillfully modeled on the irregular morphology of the coastline. At once vernacular, evocative, and fragile (Cambi, C. et al. 2017, Di Mascio, D. 2009, Carolis, D. 2020), trabocchi embody traditional technical knowledge deeply rooted in local culture and the millennial relationship between man and the sea. According to some studies, their origins date back to the Phoenician era, but it was mainly between the 18th and 19th centuries that trabocchi established themselves as a means of subsistence for coastal communities, enabling them to fish even in adverse weather conditions.

The Trabocchi Coast, an emblematic stretch of the mid-Adriatic coastline, is a cultural landscape in which the natural and anthropic dimensions merge in a delicate but meaningful balance, representing not only an architectural and functional asset, but above all a symbol of identity rooted in the collective memory and local maritime culture. The heritage value of this coastline lies in its heterogeneous morphological composition: rocky promontories, sandy coves, protected natural areas, and stretches of spontaneous vegetation coexist in a continuum that conveys an image of a coastline that is still authentic, despite anthropogenic and tourist pressures. In this context, the perception of the landscape takes on an affective and relational character, as

recognized by the European Landscape Convention and, more recently, by the amendment to Article 9 of the Italian Constitution, which explicitly includes the protection of the environment, biodiversity, and ecosystems among the duties of the Republic.

The landscape of the Trabocchi Coast has been transformed over time from a marginal and productive area to a place of cultural and tourist rediscovery, where the trabocchi have been restored and reinterpreted as heritage sites, often converted into restaurants or exhibition spaces. This process, however, is not without its contradictions: on the one hand, there is a strengthening of the sense of belonging among local communities and an appreciation of intangible heritage; on the other hand, there is a risk of turning the landscape into a museum or triggering tourist consumption dynamics that distort its original value.

The recent development of the “Greenway” cycle path, a cycling route built on the dismantled track of the Adriatic railway between Ortona and Vasto, represents an emblematic example of sustainable and heritage oriented territorial regeneration. The intervention not only restored accessibility to the coastline, reconnecting urban centers to the littoral, but simultaneously transformed landscapes, trabocchi, and historic stations into heritage assets to create slow and conscious tourism. This type of cultural infrastructure, which integrates with a historic landscape matrix, contributes to consolidating the understanding of heritage as a living resource, capable of generating economic development and social cohesion, in line with the principles of the Faro Convention.

The Greenway is configured today as a strategic resource for experimenting with integrated development models, based on environmental sustainability, heritage enhancement and the involvement of local communities. However, even in this case some critical issues emerge: while on one hand territorial identity is strengthened and a virtuous model of enjoyment is promoted, on the other hand the project implementation methods did not pay full attention to the environmental context in which it was inserted. In particular, the coastal strip within 300 meters of the shoreline is subject to landscape constraints and, in some cases, to absolute construction prohibitions, which would have required greater design caution and more careful evaluation of impacts.

Ultimately, the Trabocchi coast presents itself today as a laboratory of territorial practices in which environment, identity and development intertwine. Its protection cannot ignore an integrated vision that considers the landscape not only as an asset to be protected, but as a lived space, in which local communities play an active role in transformation processes.

Cognitive Atlas of the mid-Adriatic Abruzzo Context

The coastal stretch of the mid-Adriatic Abruzzo region constitutes a territory of extraordinary complexity, characterized by a rich interweaving of landscape, environmental and cultural values that today confront the growing pressures arising from climate change and ongoing anthropogenic transformations.

The objective in this phase of the research is to identify, map and enhance the different forms of heritage present, highlighting their potential in mitigating risk factors related to climate and social change.

The project is based on a mixed methodological approach, which integrates qualitative analysis of readings, attributed meanings and interpretations of the territory that come from local communities with quantitative analysis of environmental, territorial and socio demographic data.

Through this methodology, a multilevel reading of the mid-Adriatic coastal stretch is enabled, which relates the physical, social and cultural aspects of the territory under examination.

The atlas is therefore configured as a multi scalar knowledge tool, articulated on three levels of analysis:

- 1 - mid-Adriatic macro-context: a large scale vision of the Abruzzo coastal territory and its main environmental, morphological and settlement characteristics;
- 2 - in depth contexts: the first context (C1), the northern one with the municipalities of Pineto and Silvi and the

southern one (C2) with the municipalities of Fossacesia, Torino di Sangro, Casalbordino and Vasto;
3 - a synthesis of the critical issues and opportunities identified within the previous study levels, with the construction of a risk map interpolated with the environmental and socio demographic factors identified, which will allow the construction of design scenarios in the analyzed areas.

In this reference framework, the research aims to highlight the knowledge necessary to make it possible to re-heritage the coastline, understood as an active resource for sustainable territorial development.

Specifically in the mid-Adriatic Abruzzo stretch, heritage manifests through heterogeneous forms, which are the result of a multitude of settlement histories, urban and infrastructural transformations.

The two contexts taken into analysis in their heterogeneity, when compared, fully manifest the territories that can be encountered along the Abruzzo coast.

To the north, in the territorial area of the municipalities of Pineto and Silvi, the presence of a compact urban fabric is evident, a typical expression of the so called "Adriatic city". This settlement model develops between the coastline and the infrastructural bundle that runs longitudinally along the Adriatic dorsal, composed of railway, highway and state road. In an apparently paradoxical way, this urban density has favored the conservation of original and identity characters in the municipalities located beyond this infrastructural bundle. This linear system, while on one hand representing a strategic resource for regional and national mobility, on the other hand significantly affects the continuity and accessibility of the coastline.

The southern context includes the municipalities of Fossacesia, Torino di Sangro, Casalbordino and Vasto, which together represent that natural and rural landscape that composes the Trabocchi coast area, a territory that represents an environmental heritage of great landscape value.

The atlas proposes to map in an ecosystemic manner the coastal territories of this region, identifying the characterizing elements, today subjected to strong pressures due to rapid urbanization and seasonal tourism.

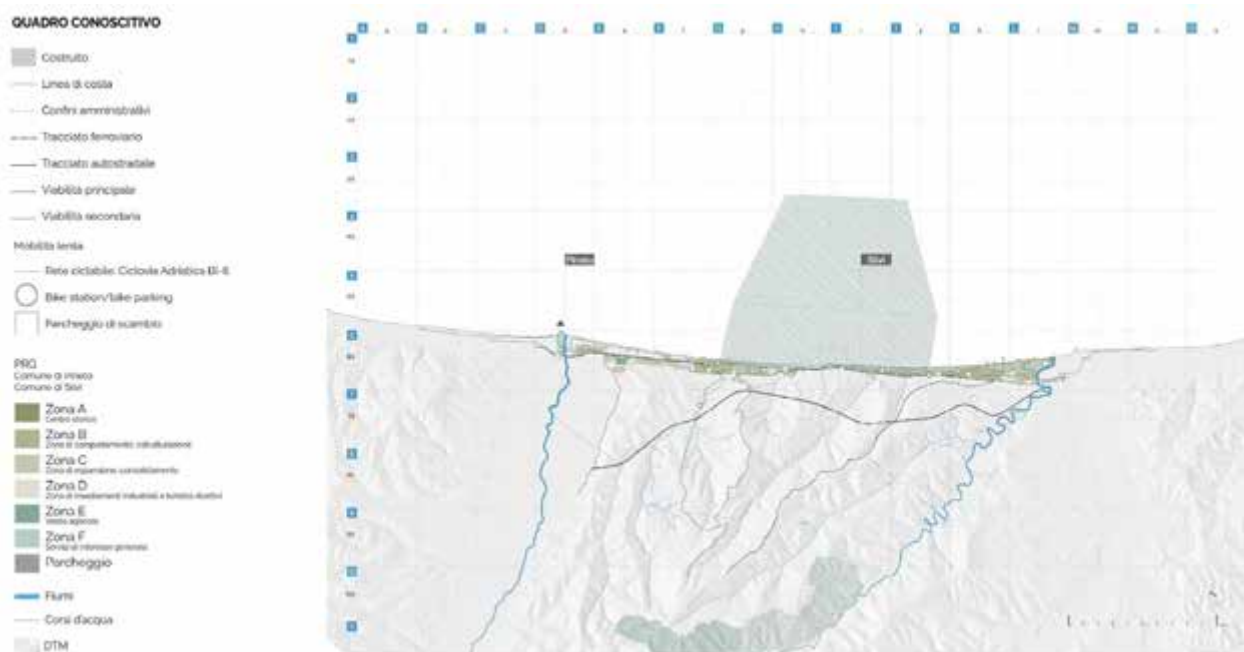


Figure 1. C1 - Pineto and Silvi area's cognitive framework designed by Andrea Di Cinzio, Angelica Nanni

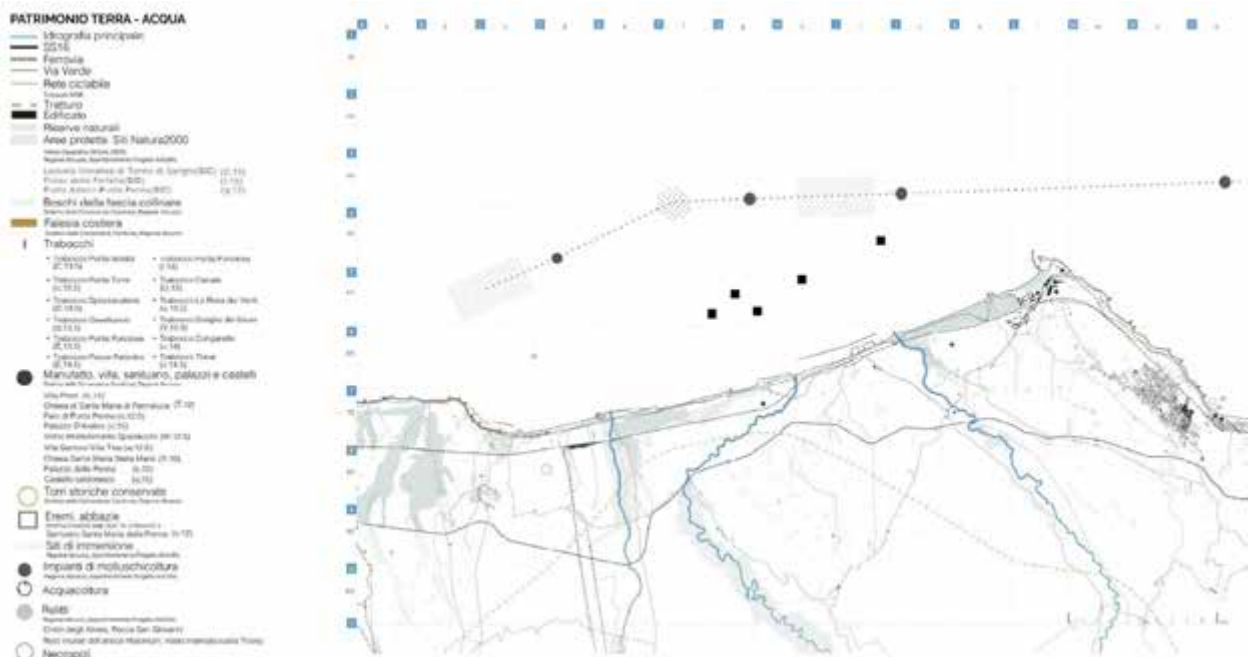


Figure 4. C2 - Fossacesia, Torino di Sangro, Casalbordino, and Vasto area's Heritage designed by Sirjia Spiritoso, Francesca Maria Santobuono

Towers, Platforms and Reserves: Anatomy of a Coastal Landscape

In this delicate and complex scenario, the mid-Adriatic Abruzzo coastal heritage is characterized through different interconnected dimensions.

The atlas, through territorial analysis, studies hydrogeological and climatic vulnerabilities. The integration of this data with social vulnerabilities allows for the construction of a complex and dynamic framework of relationships between human and environment, useful for guiding management and territorial enhancement plans and policies.

The context analysis is oriented toward an integrated reading of territories that start from the hinterland, cross the coastline and extend into the sea. This research emphasizes the necessity of considering all these environments to obtain a complete understanding of the mid-Adriatic Abruzzo stretch, since the coastal territory requires a holistic approach to be effectively understood and enhanced.

The built coastal heritage is distinguished by the stratification of elements belonging to different eras, which function as distinctive landmarks and which, as previously observed with the trabocchi structures, define the identity of the littoral landscape. An emblematic example of these territorial signs is represented by the Torre del Cerrano, located between the municipalities of Silvi and Pineto within the homonymous marine protected area. This ancient fortification, dating back to the Kingdom of Naples period, constituted a strategic node of the extensive network of coastal towers designed to counter Turkish and Saracen incursions coming from the sea.

From the summit of the historic tower it is possible to glimpse the ENI oil and gas extraction platforms that today characterize the Adriatic maritime panorama. These industrial structures, which appeared along the Abruzzo coast starting from the 1970s until the first decade of the 2000s, represent a new generation of landmarks that defines the marine horizon, often positioned within 12 miles from the coast.

The presence of these infrastructures in the mid-Adriatic stretch configures an emblematic scenario that solicits reflections on possible paths of reconversion and innovative reuse. The critical analysis of these industrial artifacts opens questions about their transformative potential: from extractive elements with controversial environmental impact, they could evolve into spaces dedicated to new cultural, scientific or eco touristic functions. Such transformation would contribute to the construction of a contemporary narration of the coastal landscape, capable of integrating historical memory and future projection in a sustainable vision of the territory.

Exposed to strong pressures and anthropic impacts, the natural heritage in the mid-Adriatic Abruzzo instead is composed of green infrastructures that also in this case want to be read, preserved and enhanced through a bidirectional reading from the hinterland to the sea and vice versa.

Representative in this case is the Natural Reserve of the holm oak forest of Torino di Sangro which, with its approximately 180 hectares of surface, connects the Abruzzo coastline to the hinterland and represents one of the few testimonies of natural forest still present in the Mediterranean area. Within it is contained an extraordinary biodiversity that needs to be preserved and enhanced: from sea level it reaches up to 115 m of altitude, collecting flora and fauna in some cases unique in the world, as in the case of the terrestrial turtle population (*Testudo hermanni*), symbol of the reserve.

A little further south we find yet another example of natural heritage in the context of the mid Adriatic Abruzzo: the Punta Aderci Natural Reserve. With an area of approximately 285 hectares that reaches 400 hectares counting the external protection area, it extends from the beach of Punta Penna to the mouth of the Sinello river. Within it shows some peculiarities to preserve such as the dune environment or some bird species like the Kentish plover (*Charadrius alexandrinus*), which also in this case has been chosen as the symbol of the reserve.

The atlas, therefore, collects this and much other fundamental information to construct a complete knowledge framework of the territory, allowing for the mapping of significant places and knowledge and distinguishing those consolidated from those that need reinterpretation. This analysis offers the basis for developing operational tools aimed at territorial enhancement, through an integrated vision of heritage capable of requalifying and restoring value to the coastline.

Climate Change Impacts on Coastal Heritage. The Vulnerability of the Mid Adriatic Abruzzo Coast

In 2014, the Trabocco Turchino, following a storm surge, collapsed. One of the symbols of Abruzzo coastal heritage was damaged by extreme events. The Abruzzo coast hosts elements of great cultural and landscape value, such as the trabocchi, today exposed to the growing effects of climate change. More intense and frequent weather marine events are already having tangible impacts on heritage: "climate change has, already today, visible impacts in terms of damage to cultural heritage" (Mascitelli, A. et al. 2023). This emblematic case demonstrates how phenomena such as sea level rise, coastal erosion and marine storms represent concrete threats to coastal assets. Recent studies on the mid-Adriatic stretch highlight "significant changes in recent decades, which pose a serious threat to cultural heritage due to climate change (sea level rise, erosion, storms, floods and salinization)" (López Campos, L. I. et al. 2024). Faced with such risks, it becomes crucial to integrate heritage protection into climate adaptation strategies, ensuring management that considers new weather climatic scenarios.

The Abruzzo coast between Pineto and Vasto presents marked geomorphological vulnerability, particularly regarding erosive processes. Studies conducted on the coastal stretch between Pescara and Ortona report an advancement of erosion due to scarce sedimentary input and intense anthropization of the littoral zone. (Tarragoni et al., 2015) Detailed analyses confirm how the Abruzzo Region falls among the Italian coastal areas most exposed to erosion phenomena and hydrogeological risk. (Cavuta et al., 2018, Zullo et al., 2022). In the Italian context, beach erosion increased by 63% between the 1970s and 2000, with Abruzzo showing one of the highest rates at the national level (Zullo et al. 2022). The coastalization of the coast and the loss of dune systems – today severely reduced – have altered natural sedimentary dynamics, contributing to the intensification of the erosive phenomenon.

Beyond erosion, the mid-Adriatic littoral is subject to local hydrogeological instabilities, with cliffs and coastal slopes unstable in some points. For example, along the Chieti coast there are landslides and ground movements that threaten infrastructures and settlements on the littoral edge (López Campos, L. I. et al. 2024). Accessibility also suffers from these critical issues: in the past the presence of coastal railway and industrial areas limited access to the sea, while today erosion reduces the usability of some beaches and imposes costly periodic beach nourishment. Beyond erosion, the coastal stretch is subject to landslides and hydrogeological instabilities linked to intense weather events and the fragility of the hills behind. An emblematic case concerns the extreme rains that occurred in 2007, 2011 and 2012, which caused strong erosion phenomena of surface coverings on Abruzzo hillsides, with average values between 0.8 and 3.1 cm per event (Piacentini et al., 2018).

These multiple vulnerabilities highlight the necessity of integrated planning and sustainable coastal management measures, capable of balancing environmental protection, territorial safety and public use of the littoral.

Adaptation and Mitigation Strategies: Design Examples and Practices

On the adaptation front, diversified approaches are being experimented along the Abruzzo coast. "Traditional" coastal engineering interventions remain important in some critical areas: for instance, new defense works such as groynes, breakwaters and submerged barriers are being designed to protect the most exposed points of the Costa dei Trabocchi (Mascitelli, A. et al. 2023). However, there is consensus that solutions must not be limited to rigidly contrasting phenomena, but rather accommodate them intelligently. "All proposals must adapt to the problem and not go against it. The keyword is adaptation: adapt the affected areas, make them resilient, adjusting to environmental changes" (Mascitelli, A. et al. 2023).

From this perspective, nature based solutions are gaining importance. For instance, the restoration of coastal dunes and backdune wetlands is promoted to reactivate natural defenses against storm surges and flooding, as well as to conserve littoral biodiversity. In non urbanized areas, the possibility of retreating or relocating infrastructures away from erosion risk zones (the so called strategic retreat) is evaluated, avoiding fighting the sea where it is not sustainable to do so in the long term. Territorial planning increasingly incorporates these approaches: the new Trabocchi coast plan, for example, prescribes considering different scenarios of sea level rise and increased hydrogeological risk, estimating the potential costs of damages associated with each scenario. This denotes a growing institutional awareness of future uncertainty and the necessity to pre adapt territorial transformations.

Even at the European level there are virtuous examples of coastal adaptation from which to draw lessons. In the Netherlands, where low coasts are particularly exposed, the innovative Sand Motor project was implemented. This is a gigantic artificial sediment nourishment implemented in 2011 along the Delfland littoral, which formed a hook shaped sandy peninsula destined to be gradually distributed by wave motion on surrounding beaches. This intervention, equivalent to about 20 years of traditional beach nourishment concentrated in a single solution, "has formed a peninsula to protect the coast, mitigate sea level rise and create recreational and ecological spaces... is achieving its objectives of coastal conservation, habitat creation and recreational opportunities" (Climate ADAPT, 2022). The Sand Motor is considered a successful example of the Building with Nature approach, in which one works with natural processes rather than against them, obtaining coastal protection together with environmental and social benefits.

Parallel to adaptation measures, mitigation remains a fundamental pillar of territorial climate strategies. Reducing climate altering emissions in Abruzzo means, for example, promoting sustainable mobility, energy efficiency and renewable sources. The transport sector, in particular, can contribute significantly through green interventions from the hinterland to the coast and vice versa and along it: such as the transformation of the former railway route into a cycle pedestrian path; incentivizing the use of soft mobility and enhancing rail mobility. This would help reduce both local atmospheric pollution and the carbon footprint of tourism.

Conclusions

The Atlas has brought to light, through the reading of the land water heritage and the construction of an articulated knowledge framework, a complex system of heritage, environmental, cultural and settlement values, which are configured today as a territorial laboratory of great interest for experimenting with enhancement and sustainable adaptation strategies. The articulation of its landscapes, the richness of natural and cultural heritage and the presence of rooted communities make it an ideal context for reconnecting protection instances with those of sustainable transformation.

The research highlights how the coast, if reread in an ecosystemic key, can become a strategic area for experimenting with alternative development models capable of integrating environmental resilience with the quality of life of settled communities. The coastal heritage, consolidated but in need of reinterpretation, thus proposes itself as environmental infrastructure and active laboratory for adaptation policies, where heritage communities, understood as collectivities that preserve and transmit stratified territorial knowledge, become active protagonists in the co design of sustainable enhancement strategies, transforming the memory of the place into a resource for adaptive innovation.

Furthermore, the integration of adaptation and mitigation measures results in a further essential action: it is necessary to adapt to impacts now underway, protecting coastal heritage and local communities, but at the same time act to limit the extent of future changes. Only through coordinated strategies on both fronts will the mid Adriatic Abruzzo coast be able to successfully face the climate and social challenges of the coming decades, transforming potential crises into opportunities for innovation and sustainable development.

The future of CostaMED research will be further articulated along three main operational directions. The first will concern public restitution and completion of the knowledge Atlas, through validation of collected data, integration of new territorial information and dissemination of results to communities, local authorities and professionals. The second direction aims at the construction of climate and sustainable development scenarios, capable of anticipating coastal territory transformations and orienting adaptation policies on local and territorial scale, integrating environmental data with socio economic dynamics. Finally, the third direction provides for the elaboration of a design guidelines agenda, structured as an operational tool for administrations and designers, aimed at guiding future interventions in a resilient, participatory and regenerative key.

In this perspective, the mid-Adriatic coast is no longer only a fragile margin to be preserved, but is configured as a strategic space for the contemporary project: a habitable, sensitive and adaptive territory, in which environmental challenges can be transformed into opportunities to rethink the relationship between heritage, communities and innovation.

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