



Ninth International Symposium



# Monitoring of Mediterranean Coastal Areas: Problems and Measurement Techniques

Livorno (Italy) 14<sup>th</sup> - 16<sup>th</sup> June 2022

edited by

Laura Bonora, Donatella Carboni,  
Matteo De Vincenzi, Giorgio Matteucci



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MONITORING OF MEDITERRANEAN COASTAL AREAS:  
PROBLEMS AND MEASUREMENT TECHNIQUES

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## MONITORING OF MEDITERRANEAN COASTAL AREAS: PROBLEMS AND MEASUREMENT TECHNIQUES

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“Monitoring of Mediterranean Coastal Areas:  
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FIRENZE UNIVERSITY PRESS

2022

Ninth International Symposium “Monitoring of Mediterranean Coastal Areas: Problems and Measurement Techniques” : Livorno (Italy) 14<sup>th</sup>-16<sup>th</sup> June 2022 / edited by Laura Bonora, Donatella Carboni, Matteo De Vincenzi, Giorgio Matteucci. Firenze – Firenze University Press, 2022.

(Monitoring of Mediterranean Coastal Areas: problems and measurement techniques; 1)

<https://books.fupress.com/isbn/9791221500301>

ISBN 979-12-215-0030-1 (PDF)

ISBN 979-12-215-0031-8 (XML)

DOI 10.36253/979-12-215-0030-1

Cover graphic design: Alberto Pizarro Fernández, Lettera Meccanica SRLs

Front cover: Port of Livorno (Italy): *Curvilinear Breakwater south end Lighthouse & lantern*, photo by Gianni Fasano

Edited by: Laura Bonora, Donatella Carboni, Matteo De Vincenzi, Giorgio Matteucci

Desktop publishing: Laura Bonora, Matteo De Vincenzi

Graphic Design: Gianni Fasano

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Published by Firenze University Press

Firenze University Press

Università degli Studi di Firenze

via Cittadella, 7, 50144 Firenze, Italy

[www.fupress.com](http://www.fupress.com)

*This book is printed on acid-free paper*

*Printed in Italy*

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FUP Best Practice in Scholarly Publishing (DOI 10.36253/fup\_best\_practice)

Laura Bonora, Donatella Carboni, Matteo De Vincenzi, Giorgio Matteucci (edited by), *Ninth International Symposium "Monitoring of Mediterranean Coastal Areas: Problems and Measurement Techniques". Livorno (Italy) 14<sup>th</sup>-16<sup>th</sup> June 2022*, © 2022 Author(s), CC BY-NC-SA 4.0, published by Firenze University Press, ISBN 979-12-215-0030-1, DOI 10.36253/979-12-215-0030-1

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# A NEW PROPOSAL FOR A STRATEGIC AND RESILIENT REGENERATION PLAN FOR SEASIDE WATERFRONTS. AN ADRIATIC CASE: RICCIONE

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**Abstract** – Affected by the increasing violence of the effects of climate change and the neglected awareness of unavoidable sustainable planning, the border areas between sea and land face recurring emergencies and worsening natural risks. That special environment along the coastline, sometimes still enveloped by wilderness, sometimes strongly marked by urbanisation, is threatened by the sea level increasing and the progressive coastal erosion with irreversible injuries. Consequently, several different and innovative strategies must be arranged to compensate for the effects of change and ensure a future for these territories.

The case study concerns Riccione, an Adriatic city and a seaside resort, which presents an easily recognizable and remarkable typological model for urban structure, consolidated economic organisation, social relationships, and an appreciable balance between people needs and the natural resources. In this context, the research attempts to propose a new territorial strategy to innovate the regeneration process based on new resilience conditions. The approach suggests local actions at the local level (planning and traditional procedures and innovative interventions aimed at a spatial-functional requalification of the whole waterfront system), but also at the territorial level (embedding urban elements and natural coastal components, economic issues and environmental needs).

## The weakest spot in the coastline system

As in the past, once again the coast shows itself as an extraordinary place where natural processes and human actions manifest their changes and interactions. In a most evident and dramatic way, the coast is constantly affected by land consumptions for urbanisation, industrialization, and infrastructure development; even in the same time protected coastal reservation areas increase and a stronger attention is paid to surviving marine natural areas. If sudden and very violent storm surges as well as the silent but constant erosion of the shores alarmed communities pushing for new attempts to control coastal natural hazards, the devastation of inlands and the effects of a hydrogeological instability spill excess water and mud toward the coast warning about the weakness of this environment.

Everything makes the coast a weak but resilient demarcation between an advancing system and another forced to retreat, from time to time confusing which realms is really next to surrender and remarking how the coast is a changing environment that only at alternating periods, with more or less long laps seems to find forms of stability.

Along the coast line, in fact, the natural morphologies are temporary; and all the processes of use of this very particular context appear transitory, as well as the settlement

systems that have followed one another over time: like footprints on the shoreline, no form can be said to be definitive and lasting.

Consequently, the coastline environment, sometimes still wrapped in wilderness, sometimes strongly marked by urbanisation, threatened by the increase in sea level and the progressive erosion of the coast with irreversible injuries, requires a number of different and innovative strategies to compensate for the effects of change and ensure a future for these territories.

Very strategic cores of this complex coastal, the seaside resorts over the past years changed from simply touristic locations or attractive holiday destinations in large and intensive urban settlements, marked by composite economic organization based on mixed and different activities: A complex 'sea vacation machine' with very high environmental impacts, though with very high incomes for tour operators and local stakeholders: It is easy (maybe cynical but not misleading) to suppose that degradation of the basic resources of this powerful economy is the real trigger of new sensitivity for the protection and safeguarding of the coastal environment. Anyway, just in the urban centres of the coastline we could recognize the most environmentally impactful settlement and at the same time one of its weakest spots, for they are exposed not only to uncertain tourism flows and trends (as we recorded during the pandemic), but also to the already known degradation processes of the urban settlements (congestion, land consumption, urban quality levels decreasing, facilities obsolescence) and to the extreme natural events such as coastal storms, floods, and landslides, as well as longer-term risks of coastal erosion and sea level rise.

According to these remarks, the following considerations attempt to outline a proposal for a planning strategy to ensure sustainable and resilient development for large urban seaside resorts. In fact, the paper is intended to present an innovative focus on the coastline topic, moving from the analysis of the seaside waterfront's peculiar features but refusing the current separation of border areas (seashore, beach, promenade, and buildings overlooking the seaside) from the rest of the urban organisation. The waterfront is not intended as a borderline, but rather as a complex and integrated urban border area, with potential regeneration characteristics that are also strategic to trigger a redesign of the entire urban settlement.

A new policy for an 'inter-relational' coastal territory aware of the waterfront as a multitude of anthropogenic functions and landscape morphologies will be the key to understand in a single regeneration action all the complexity of a coastal seafront. This will be the first step towards defining a new city-beach-sea relationship.

The paper remarks the need for a methodological approach concerning coastal areas, taking into account all the issues emerged in the survey (i.e. relationships and urban features shaped by the touristic vocation, sandy shores as a well-identified space in the city, the related symbolic value, etc.). These elements are crucial for the development of a strategic planning led to empower a resilient urban-coastal landscape, ensure the economic development of a seaside resort well matched with the natural environment, cultural heritage and social identity matrix.

## **A peculiar context and local coastal issues**

To develop a new strategy for a sustainable approach for a large and urban seaside resort, we focused on one of the most important sites on the Romagna coastline, Riccione,

in the 'Adriatic riviera': One of the best known destinations of international tourism in northern Italy. Although we are talking about one of the most developed "sea vacation machines" (for its high-quality beach infrastructures, the potent set of attractive resources, the best holiday accommodation organisation supported by very comfortable private and public facilities), the area tackles the same threats as the whole Italian coast does.

The case study involves the Adriatic city of Riccione, a seaside settlement that presents an easily recognizable and analyzable typological pattern in the peculiar, urban, and social relationship between human needs and natural space. The look at Riccione represents the choice of analysing a 'mature' context, with consolidated urban characters and in progressive evolution to the ecological, social and economic conditions: a territorial 'coring' to understand in detail which new strategies and actions to put in place.

In fact, Riccione, even if its seaside economy started at the beginning of the last century, developed mainly in the 1950s when it became one of the most organized resorts of the "riviera romagnola": Very requested destination for many Italian families, tasting the effect of post-war economic success, increasing salaries, when seaside vacations became a middle-class status symbol more than a healthcare factor. The success drove an urban development which, though in moderate forms, enlarged the urbanised areas, sieged the seaboard and limited the beach extents, converted natural areas in built-up neighbourhoods for quite 60 km from Ravenna to Gabicce. This stretched urban organisation has seemed in a fragile environment balance, which today is now close to risk for multiple factors, largely attributable to the effects of climate change.

The first consequence of this fragility can be identified in the damage caused by the extreme events that injury the Italian coasts, with risks of natural disasters and the prospect of a constant worsening of the intensity with which the phenomena strikes. These concern both catastrophic events, such as hurricanes, tornadoes, and cloudbursts capable in a few hours of destroying kilometres of coastline causing serious damage to beach facilities, and a gradual increase in wave energy that may become significant in the future.

For this reason, one of the greatest risks that may affect the waterfront is being gradually 'erased' by coastal erosion and sea level rise. For many years now, sandy coastal areas have been subject to shoreline retreat, through a more or less violent action depending on regional geomorphological contexts [1]. The causes are found not only in the gradual melting of the glaciers that raise the sea level, but also in the destruction of the dune cordon and the construction of ports. But that is not all; in fact there is also the problem of salt rising along the rivers, which would lead to very serious events even inland, starting with the territories closest to river mouths.

Then, geodynamic forecasts show how the sea level gradually rises and there are territories that are more subject to subsidence, as the cases identified between the Po Delta and the north Romagna coast, also due to massive extraction of gas from the soil [6]. The environmental pressure due to climate change is accentuated by the excessive (and unplanned) use of coastal areas that were 'invaded' by mass tourism. The almost complete saturation of the land guaranteed a rich economic return, but the original character of the sites was lost, transforming the green cities into a compact expanse of residences and hotels [6].

So it is a combination of anthropic and climatic actions that influence the state of coastal environments: while the effects of global warming have led to a consequent increase in surface water temperature, as well as marked fluctuations in sea level [1], unplanned land consumption near the coast increases the severity of damage.



For years, there has been a succession of plans that deal with the problem of coastal erosion, proposing solutions and operations aimed at safeguarding and defending sandy sediments through beach nourishment, beach restoration, construction of winter barriers to protect both beach facilities and the sediment volume of the beach.

In this regard, sand dunes and the extension of submerged erosion barriers are interventions that, while protecting beaches from erosion risk, are mechanical and artificial in nature, so they still cause an impact, although controlled, on the land [8].

These actions are provisional; in fact, they aim to maintain the natural and socio-economic multifunctionality of the complex coastal system [1]. The problem of coastal protection meets other problematic issues in the application of European legislation on beach concessions that recently has been at the centre of a lively political debate and a clash among operators. The social and environmental dynamism that characterizes coastal areas, combined with their high physical vulnerability, draws attention to the need for a unitary policy that is attentive to future prospects and capable of holding together a constantly changing system, on which insist not only landscape values but cultural and economic values that need to be preserved.

An urban planning focused on coastal areas, in addition to being a fundamental prerequisite for a correct management of interventions, would have the task of regulating economic activities and protecting the territory of the land-sea interface, guaranteeing its tourist development and environmental sustainability [5]: such as the management of sandy shores, which remain stuck in rather obsolete instruments, whose most innovative content appears to be due only to the spatial organization imposed by the current epidemiological situation, rather than proposing new layouts and new forms of arrangement and use, which take environmental issues, which could lead the project for the 'beach space' [2] towards a qualitative rethinking of its functional structure, so that the entire waterfront could be translated into a shared process of spatial-functional regeneration, capable of connecting according to a plurality of relationships, city and coast.

## **The analysis of the case study**

The case study involves the Adriatic city of Riccione, a seaside settlement that presents an easily recognizable and analyzable typological pattern in the peculiar, urban, and social relationship between human needs and natural space.

Riccione represents the opportunity to analyze a 'mature' context, with consolidated urban characteristics and a settlement in progressive ecological, social and economic evolution: a territorial 'coring' to understand in detail which new strategies and actions to implement. In this context, which we could easily describe as a paradigmatic 'Adriatic seaside typology', the research attempted a proposal for a territorial strategy, for a possible innovation of the regeneration process marked by the identification of new conditions of resilience, translated into design guidelines and actions that can enhance a spatial functional redevelopment of the whole waterfront system, linking a plurality of urban and coastal relationships.

Moreover, innovation is already taking place in the administrative field through the adaptation of the current urban structural plan into a new PUG (*Piano Urbanistico Generale*) as imposed by the new Emilia-Romagna Regional Planning Act n. 24/2017,

through which a strategic framework marked on increasing resilience by mitigating hydrogeological risks and increasing soil permeability, economic growth, qualification of public spaces and the natural environment will be territorialized.

The real challenge will be to be able to use the new tool as a possibility to work on the urban edges of the city-beach boundary (which falls under the current ‘Piano degli Arenili’): important lines of union and hinge, between two territorial parts and two social and economic realities that look at each other and interrelate exchangeably within the complex and unique system of the seaside waterfront.

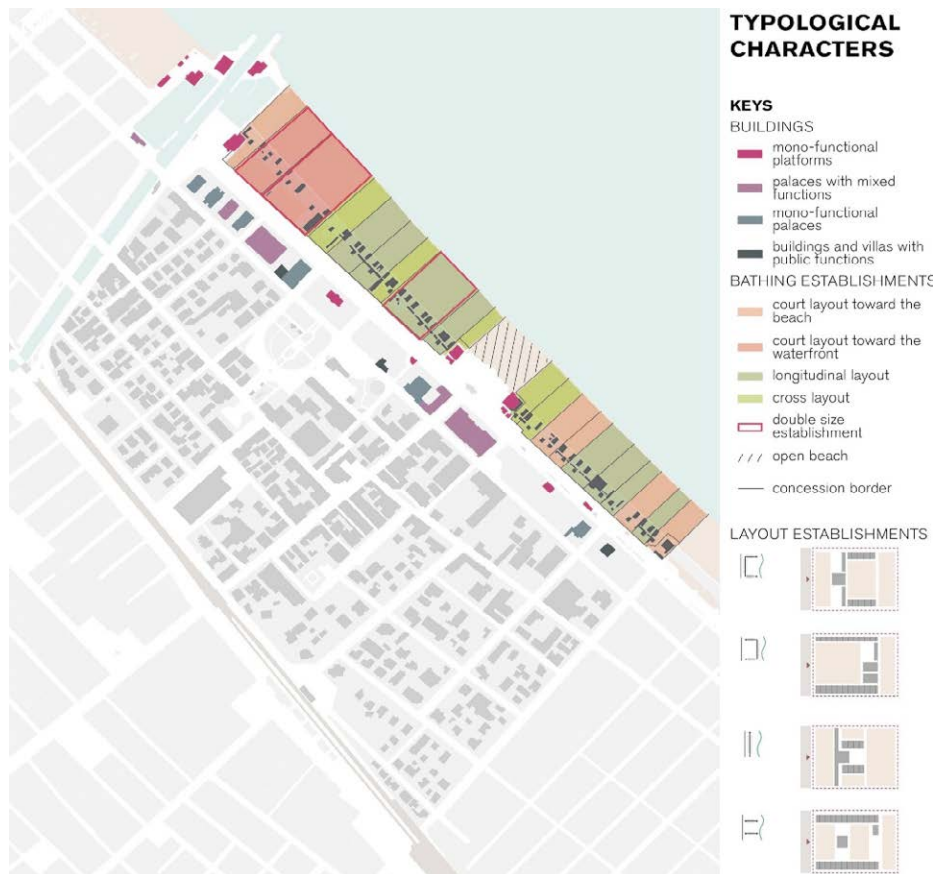


Figure 1 – The typological characters of the waterfront of the Ceccarini district.

Furthermore, an urban planning focused on coastal areas, which is a fundamental prerequisite for proper management of interventions, would have the task of regulating economic activities and protecting the land-sea interface territory, ensuring its tourist development and environmental sustainability [5].

In fact, the integration between the organization of the beachfront and the urban section behind it pushes for a rethinking in a concerted and synergistic way between the two areas that are generally managed with different philosophies and tools, and it is also with this additional spirit that the research on Riccione's seafront could be fielded.

Through in-depth reflections on the potentialities and criticalities of Riccione's beach-coastal system and in detail those of the Ceccarini district, the specific study area of the following research, it was possible to detect all the complex urban-economic relations that are established between waterfront and city. Relevant spatial and functional components were highlighted, which led to the formulation of an abacus of typological situations (Fig. 1) that are valid as a basis for the study of other seaside territorial realities. This particular study was carried out through the identification of the succession along the waterfront area of the various morphological and functional types and the identification of the different sizes, arrangements and functional types found along the strip of establishments and along the strip of public and private buildings facing the waterfront.

This analysis has resulted in a proposal for the regeneration of the morphological system of the seaside waterfront through the drafting of guidelines whose objective can be identified in the intent to give a direction to the transformation of the coastal-seashore waterfront toward the construction of a 'hybrid' space where adaptation actions and regeneration actions, having as their object urban and natural space, fit into a single resilient design system, always considering the risks generated by the processes induced by the current climate change, conditions from which coasts and shorelines are not spared.

From this perspective, the rethinking of the system of coastal planning in terms of adaptation to climate change is seen as an opportunity to introduce new processes of redevelopment of land-sea spaces, and to draw up programs voted to ensure transformations for a better urban quality, a urban regeneration of neighbourhood, a social and economic as far-reaching and medium-long term.

The need to define a programmatic methodology approach to the theme of coastal territories regeneration is imperative to take all those specific aspects that pertain to the sphere of 'seaside' (see the urban relations and characters shaped by the tourist vocation of the place and the sandy shores as a well-identified space of the city); a decisive characteristic in the choice and development of a strategic design study that has the intention of restoring to the urban-coastal, a resilient landscape associated with a settlement and tourism model in contact with the natural environment, without denying its historical and social matrix.

## **A strategy for Riccione's seaside waterfront**

The strategy, drawn for an area of Riccione's territory, Ceccarini district, is made up of a large set of actions that contribute together to the formation of a new coastal bathing landscape integrated spatially and functionally with urban settlement.

The structure of the guidelines (fig. 2) is based on the construction of a diagram in which the main strategies are followed, like corollaries, by increasingly specific actions:

- a) four thematic fields that are based on the recognition of the waterfront as an 'identity place' for the city;

- b) two strategic objectives that represent the main lines of action to which all interventions at different scales refer;
- c) general strategic lines that identify specific local actions.

The division between general strategies and local actions allowed the purpose of specific solutions for the case study and, on the other hand, the extent of the strategic vision. This last step is part of the need to propose a large-scale strategy, in which all the specific actions on an urban scale converge, representing an attempt to respond to the “substantial fragmentation of the coastal system” [9] that has often marked the intervention methodology on the waterfront, excluding it from integrated considerations or territorial plans.

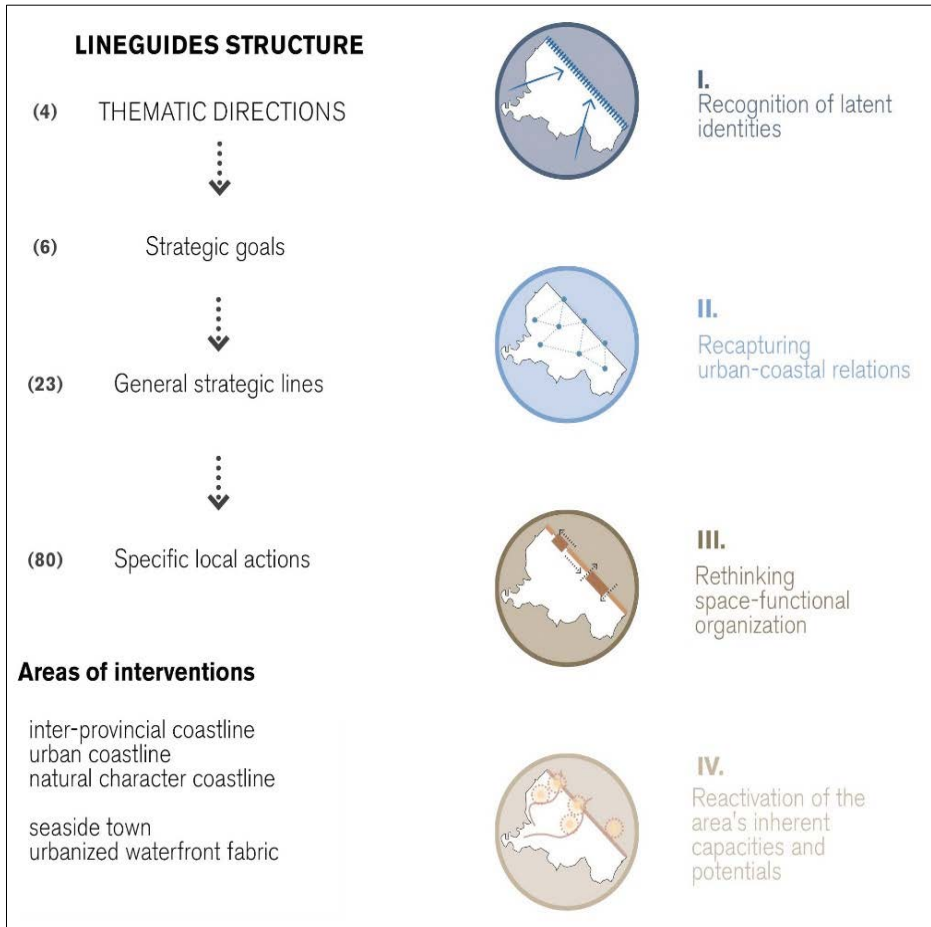


Figure 2 – The structure of the guidelines.

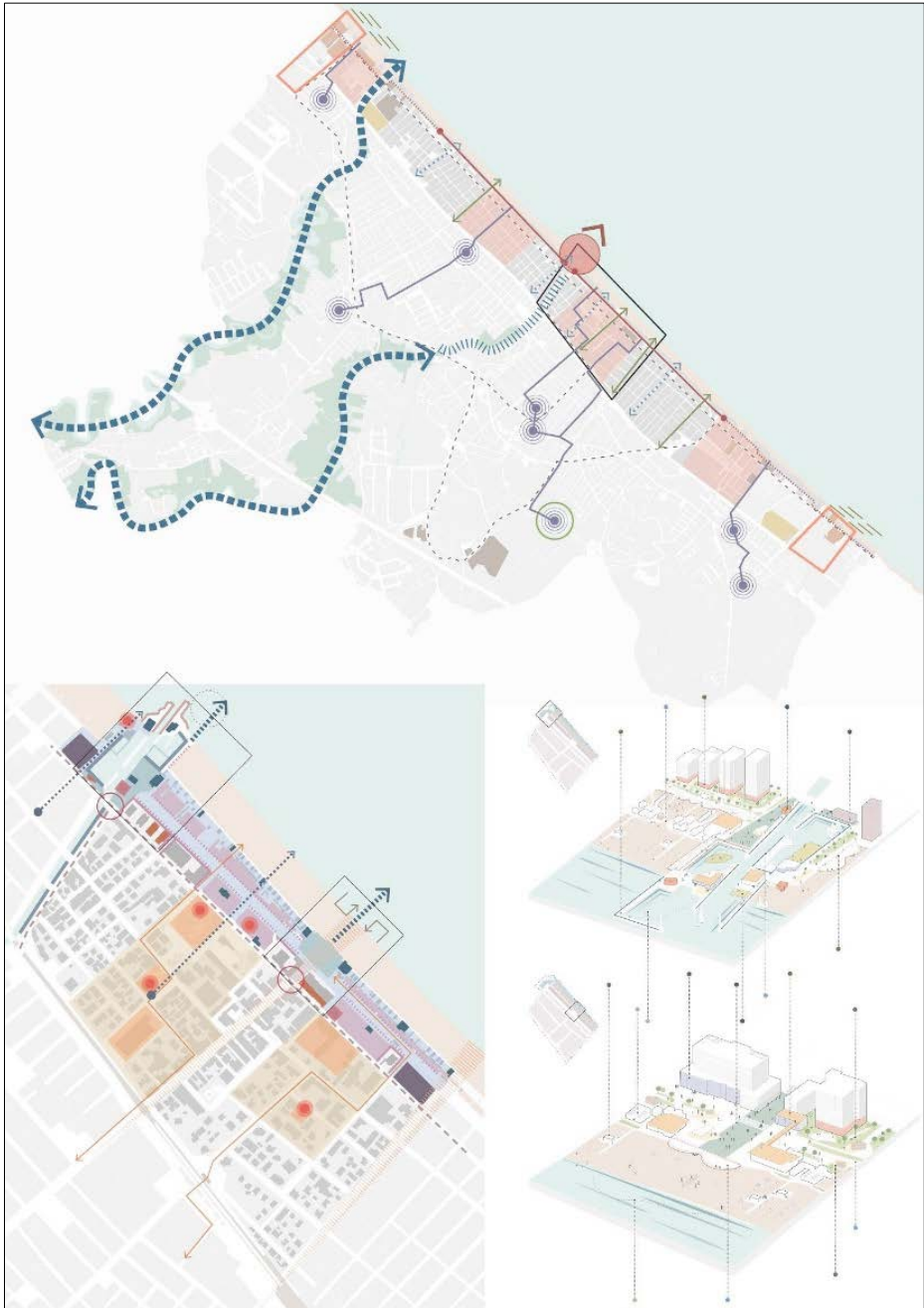


Figure 3 – Strategic visions: Identification of some spatial strategies based on the structure of the identified guidelines.

## Conclusions

In the whole proposal, actions aimed at building an urban landscape capable of facing future environmental challenges are not left in the background (see the objective “Reactivation of the capacities and potentials” objective). According to the vulnerabilities and critical aspects identified in the analysis of the Italian coastal system, the strategies are divided between the restoration of natural coastal defense systems (localized measures aimed at containing erosion as a consequence of the effects of climate change, which are already present in scientific documents approved at both the regional [7] and supraregional [4] levels) and the enhancement of the built heritage in relation to the preservation of the unbuilt.

Thus, the need to propose interventions for environmental restoration, improving resilience and adaptive capacity of the territory through the exploitation of natural resources and limitedly invasive actions is taken into account while respecting the coastal landscape.

Finally, thanks to the translation of the guidelines into graphic maps, it is possible to identify two strategic visions for the regeneration of Riccione's seaside waterfront (fig. 3) and the Ceccarini district that highlight the inter-relationship between the different thematic lines of intervention, from the strengthening of natural and infrastructural land-sea connections, to the rethinking of the spatial and functional organization of the built and unbuilt areas of the waterfront and the bathing spaces.

This is particularly emphasized as a strategic element of integration between the inner urban fabric – the city – and the ‘natural’ coastal system – the beach; a relationship that is not only physical or social and economic but also psychological and perceptual, for which the waterfront is the knot of the multiple relationships that can be recognized between the urban environment and the natural system, and that should guide a place-based urban regeneration.

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