



A COASTLINE ON THE EDGE

Recommendations for integrated management of the catalan coast



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EXECUTIVE SUMMARY

The coastline has been and still is an essential part of our country, not only from the environmental, social and economic viewpoints, but also for cultural and historical reasons. Catalonia has a long coastline (1 linear km for every 55 km² of land area; DTES 2019a) and the 70 coastal municipalities, which make up 6.7% of the territory, concentrate 43.3% of the country's population and a very large part of its economic activity, including tourism.

However, the Catalan coast is standing at a tipping point:

- The sea level at L'Estartit has risen almost 10 cm in the last 30 years (SMC, 2021). In the Mediterranean, the sea is rising at an annual rate of 4 mm/year (MedECC, 2020) and, on a global level, projections suggest that the sea level will rise up to 1 m by the end of the century (Arias et al., 2021).
- Between 1995 and 2015, the Catalan beaches retreated about 0.44 metres a year, although, in actual fact, the lost shoreline was much greater (1.6 m/year; Jiménez et al., 2019) along 65% of the coast. This vulnerability fluctuates along the coast, with particularly critical areas such as Alt Empordà (Sánchez-Arcilla et al., 2016).
- Only 20% of the coast has enough space to continue retreating to tackle the rising sea levels. Since 2017, a significant regression of the beaches has been observed in certain parts of the metropolitan coastal area, with average regression rates up to 9.8 m/year in Badalona and 7.5 m/year in Montgat (BR, 2021).
- According to the most favourable forecast, by 2035 only 54% of today's beaches will have the necessary width to continue providing leisure services and 9% will be completely eroded (Jiménez et al., 2019).
- 61% of the beaches have been affected by the disappearance of dunes, and 30% have lost dune habitat during the second half of the 20th century (Garcia-Lozano, 2021).
- Between 2002 and 2010, approximately 775,000 m³/year of sand were replaced on the Catalan coastline, mostly on the beaches of Barcelona (Jiménez et al., 2019). However, regenerating sand using mechanical means is unsustainable in the long run, with high economic and environmental costs that are constantly increasing.
- Reduced river flows and sediment transportation to the coast is causing deltas and other sandy coastlines to recede, as a result of erosion and subsidence processes. Particularly in the Delta de l'Ebre, the coastline is receding more than 10 metres/year at the river mouth. The Llobregat river mouth has receded almost 1 km during the last century (Martin-Vide, 2020).
- Considering the first 100 metres of shoreline, 59% of the coastal strip is urbanized. This percentage increases to 81% if the Cap de Creus and the Delta de l'Ebre are excluded (DTES,

2019a), and there are plans to build another 120,000 new dwellings. These plans are currently being reassessed under the Urban Master Plan of Non-sustainable Land Review, as is the case of the review of the Girona coastline, approved in 2021, which is expected to prevent the construction of 15,000 new houses (DTES, 2021).

- 70% of the species and 50% of the coastal and marine habitats included in the Habitats Directive are in a poor state of conservation and only 17% of the habitats can be considered well preserved (DTES, 2019b). More than 28% of the 133 saline, coastal and marine habitats existing in Catalonia are threatened (Carreras et al., 2012).
- A regression is observed in the *Posidonia oceanica* and other phanerogams meadows, rocky habitats dominated by macroalgae and the coralligenous. The meadows are highly fragmented and severely stressed by a number of factors, including nutrient and pollutant run-offs from the land, artificialisation of the coast, artificial regeneration of beaches, persistent impacts from the use of certain trawling methods (prohibited on phanerogram algae beds), and disruption caused by the excessive practice of water sports.
- Excessive infrastructure concentration, artificial *rigidisation* of the shoreline and inland sediment retention along river basins, combined with the rising sea levels and changing wave patterns, are becoming the main drivers of habitat loss and degradation, both in terms of surface area and in quality and resilience.
- Each year, more than 200,000 tonnes of plastic are discharged into the Mediterranean Sea (IUCN, 2020). Most of the plastic found on the beaches are fragments of consumption products waste (bottles, food wrapping and cigarette; Grelaud & Simón, 2021). This plastic and other pollutants can enter the food chain, with a potential direct impact on human health still being investigated (European Commission, 2019), as well as causing strangulations and deaths by massive plastic intake by animals.
- Catalonia received 19.4 million foreign tourists in 2019, 90% of whom stayed in coastal municipalities (IDESCAT, 2020). Climate change is a very important factor that must be taken into account when considering the prospects for the tourist industry's future growth. Particularly in the case of sun and beach tourism, the studies suggest that it is highly dependent on the availability of beaches and climate conditions.
- The impacts of climate change on the coast (rising sea levels, more destructive sea storms, torrential rain, etc.) will affect transportation, energy, sanitation and communication infrastructures, ports and coastal protection systems. Many of them are located in areas prone to flooding or vulnerable to climate change. A case in point is the suburban train line R1 which, according to the studies, will have to be moved further inland in the medium term (CEDEX, 2018).
- In January 2020, storm Gloria caused damage with an estimated cost exceeding 75 million euros in repairs to ports, beaches and seafront promenades (Roca et al., 2020).

A vision and 10 guidelines for a sustainable coastal planning and management

Under the current context of climate and environmental emergency, we must identify the best ways to adapt the coast to the new biophysical, social and economic reality, transforming the coastline's problems into new opportunities for an ecological transition. This is the goal pursued by this report, in which the CADS (Advisory Council for Sustainable Development of Catalonia) addresses the integrated management of coastal areas, applying an ecosystem-driven approach, and encompassing the inland part behind the shoreline, the shoreline itself, and the immediate sea environment.

Based on these statements, the CADS has proposed the following vision of the future of the Catalan coast:

The vision of a sustainable coastline necessarily implies that human action is circumscribed to its carrying capacity, taking into account climate change scenarios and considering the many ecological, social and economic influences and interactions with other territories.

Circumscribing human activity to the biophysical boundaries of the coastline will imply new models of economic development that will enable replacing the activities that are driving the current degradation towards a new paradigm, with solutions based on boosting nature.

This social and economic alignment with the carrying capacity must be accompanied by an ambitious restoration, derigidisation and active conservation process that includes both above-water and below-water environments.

Given the complexity of the socio-ecological system, coastline transformation must follow the principles of adaptive management, particularly in those areas where there is less knowledge of dynamics and impacts. This management model must necessarily include active participation by the many agents operating in the coastal areas, which in turn requires greater focus in both research and dissemination.

Finally, if the transition is to be fair, the coastal transformation and maintenance costs must be distributed equitably among the beneficiaries.

In developing its recommendations, the CADS has established a **decatalogue of guidelines for coastal organisation, planning and management within the framework of the Integrated Management of Coastal Areas (GIZC)**, which the CADS used as a conceptual and methodological reference and to ensure consistency between the various actions proposed. The guidelines are the following:

Categoría	Directriz
Develop new management models that mitigate human impact, reduce exposure to climate change and improve the coastline's sustainability.	<ol style="list-style-type: none"> 1. Promote new economic development models focused on people and service quality, avoiding overcrowding and restoring degraded areas. 2. Expand the territorial scale of the coastal management actions, encompassing the inland river basins and adjoining marine environment. 3. Accelerate the climate adaptation process, rethinking the coast to make it more resilient to impacts (particularly the rise in sea level and increased frequency and intensity of storms).

Categoría	Directriz
Preserve and restore ecosystem dynamics and foster nature-based solutions.	<ol style="list-style-type: none"> 4. Protect biodiversity and retrieve part of the lost biodiversity through large-scale coastal ecosystems and high socio-ecological value areas restoration, including water and sediment flows in the rivers and streams that discharge into the sea. 5. <i>Derigidise</i> and deurbanise the coastal areas that are most anthropised and most exposed to climate risks, or closest to natural areas, to recover the dynamics of coastal ecosystems insofar as this is possible, giving priority to nature-centred solutions. 6. Advance in the ecosystem management of marine areas and resources, increasing the surface of marine reserves, regulating leisure activities and making fishing and aquaculture more sustainable.
Transform governance through the inclusion of all social agents and the best scientific knowledge available.	<ol style="list-style-type: none"> 7. Deepen knowledge and research activities to define adaptation paths. 8. Disseminate knowledge for a more participatory and informed society. 9. Consolidate co-governance as a decision-making and management mechanism and foster public-private partnerships. 10. Contribute to an efficient and fair distribution of costs among the various coastal agents.

10 proposals for the sustainability of the Catalan coast

With the approval of Law 8/2020 on the protection and regulation of the coast, an opportunity has been created to significantly change management of the Catalan coast. The creation of the Coastal Conservatory, one of the Law’s mandates, the approval of the Urban Master Plan of Non-sustainable Land Review for the Girona coast, and the acceleration of preparation processes for the Non-sustainable Land Review of the coastline from Malgrat de Mar to Alcanar, as well as the Coast Protection and Regulation Plan, should offer further opportunities in this respect.

Going further, the CADS presents 10 recommendations for advancing toward coastline sustainability, which could become the basic pillars for a far-reaching agreement that would set the priorities for protecting coastal and sea environments, facilitating their adaptation to climate change and promoting the blue economy. They are the following:

1) Create and empower the Coastal Conservatory as a body with coastal planning and management functions and endow it with legal powers and resources to undertake coastal restoration and *derigidisation* actions.

The proposal includes the following actions:

- Prepare and implement coast *derigidisation*, restoration and preservation Plans.
- Support socio-economic development related with the delimited areas.
- Define research priorities and promote training programmes.
- Disseminate knowledge on the state of the coastline.
- Create and energise the coastal forum.
- Review the destination from certain tax instruments such as the tax on stays at tourism establishments.

2) Design and implement a strategic plan and an action plan for coastal *derigidisation*, restoration and conservation.

The proposal, which partially develops the previous proposal, includes the following actions:

- Delimit the areas of priority interest for performing *derigidisation*, restoration or conservation actions to retrieve certain ecosystem processes (areas should be delimited taking into account the vulnerable habitats, the critical spaces that may be exposed to high pressures, and the opportunity spaces that may be involved in sale transactions).
- Following from the previous action, purchase land through the Coastal Conservatory (by direct purchase or using preferential rights) and design an action plan that defines the actions to be carried out on this land.
- Through the Coastal Conservatory, develop a priority action line with respect to the dune-beach system.

3) Design and develop the Tourism Plan, which includes actions aimed at boosting the coastal tourism industry's resilience and supporting restructuring tourism activity, taking into account the territory's carrying capacity, the need to promote deseasonalisation, foster quality employment and create conditions conducive to environmental sustainability.

The proposal includes the following actions:

- Draw up a tourism plan that defines the different areas where domestic or foreign tourism needs to be promoted and the areas that are saturated or overexploited by tourism, projects the trends in the coastal areas with respect to tourism availability, and proposes appropriate mechanisms for adjusting supply and demand.
- Intensify efforts to promote sectoral tourism projects based on sustainability-driven values.
- Create an environmentally sustainable transport network.
- Foster deseasonalised domestic tourism.
- Guarantee access to tourism for the more vulnerable population groups in Catalonia.
- Disseminate the best practices on consumption reduction and efficiency in establishments.

4) Promote a Plan for transforming and rehabilitating the urban coastal habitat that interlink urban and natural or semi-natural spaces to improve landscape and citizens' well-being, ecological connectivity and the provision of key ecosystem services to population, while improving the ability to adapt to climate change.

The proposal includes the following actions:

- Support and promote structural measures for green infrastructure construction and consolidation from a supramunicipal perspective, with the goal of establishing a real connection between the natural environment and built-up areas and also between the sea front and the country's inland areas.
- Support specific actions to foster urban biodiversity and nature-based solutions, such as permeable paving.
- Improve urban infrastructure with remediation, renovation and recycling actions in coastal urban centres.

5) Draft a programme of urgent measures to adapt to climate change in mobility, water supply, coast protection and housing infrastructures.

The proposal includes the following actions:

- Assess the resizing, reformulation or even removal, in some cases, of certain infrastructures, with particular emphasis on road infrastructures, ports, water supply infrastructure, coastal protection structures or seafront promenades.
- Develop legislative and planning instruments to prevent the public sector from bearing the full cost of the necessary transformations to adapt to climate change.

6) Restore the hydromorphological dynamics of the river systems and coast.

The proposal includes the following actions:

- Urgently implement a permanent sediment *by-pass* system at the Riba-Roja reservoir, as a pilot test for subsequent application in other reservoirs.
- Promote *derigidisation* actions for canalised rivers and for restoring river connectivity and flood plains.
- Guarantee sufficient water supply to maintain ecological flows in the rivers.
- Study the restoration of longitudinal sediment transport along the coast, currently modified by the presence of seawalls and ports.

7) Develop and broaden conservation, restoration and ecosystem management tools in marine coastal systems that guarantee biodiversity maintenance and recovery and pursue the sustainability of fishing and other blue economy uses, fostering co-governance mechanisms.

The proposal includes the following actions:

- Expand the fishing restriction and ecosystem recovery zones, giving priority to co-governance mechanisms.
- Put in place measures to increase the fishing fleet's sustainability and promote seafood stewardship.
- Adopt measures to increase the resilience of aquaculture, such as integrated multi-trophic systems or sustainable seaweed production.
- Develop an integral plan for conserving and restoring the most vulnerable habitats.
- Adopt measures to guarantee that the construction of new energy transition-related infrastructures, such as offshore wind farms, are compatible with the ecosystems' sustainability.

8) Develop the necessary legislative and operational instruments for putting in place a circular economy and waste management model that reduces the volume of plastics and other wastes and pollutants that reach the sea.

The proposal includes the following actions:

- Applying an ambitious vision, transpose the European directive on the reduction of single-use plastics to the Catalan legal system.
- Approve the Law on waste and resources, which includes appropriate measures to overcome the present model's efficiency limits and put the country on a road toward a more circular model that minimises the impact of its production and consumption.

9) Introduce new environmental taxation instruments on business activities and private property that encompass the many users and uses of the coast and enforce the “polluter pays” principle.

The proposal includes the following actions:

- Study implementation of a tax on secondary residences and on the capital gains derived from their sale.
- Complete and review the taxes on the occupation of publicly owned seafront.
- Apply payment schemes for environmental services.
- Review the application and environmentalisation of existing tax instruments such as the tax on stays at tourism establishments.

10) Develop a coordinated strategy and a surveillance and monitoring programme for the coastal system that guarantees monitoring coastline status and dynamics, takes into account existing previous series, and provides for the development of robust prediction and risk analysis models that facilitate an effective adaptive management.

The proposal includes the following actions:

- Allocate more resources to mapping, diagnosis and follow-up of the ecosystems’ status and dynamics and the anthropogenic impacts they receive.
- Implement dynamic assessments of coastal risks and vulnerabilities, including both onshore and offshore habitats.
- Develop the Operational Oceanography Service of Catalonia.
- Recover and compile historic data and series generated from offshore and onshore sources and complete the systematic collection of data for integrated monitoring of the socio-ecological coastal system.
- Facilitate access to information with accessible platforms and support citizen science campaigns involving the coast.

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