Lessons learned and recommendations based on EU coastal protection management practices & strategies

National Strategic Plan for Coastal Protection

considering the effects of climate change

Following request from the Spanish Ministry for the Ecological Transition and the Demographic Challenge (MITECO)

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For more information:

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SUMMARY

This document presents the summary of lessons learned and recommendations based on EU coastal protection management practices and strategies and is a technical document to support the Spanish "***National Strategic Plan for coastal protection considering the effects of climate change***", funded by the Structural Reform Support Programme of the European Union following the request from the Spanish Ministry for the Ecological Transition and the Demographic Challenge (MITECO).

The main aim of this document is to provide guidance by presenting relevant lessons learned and recommendations from existing practices from selected case studies from France, Italy, Portugal, Ireland, and The Netherlands to support the implementation of the Spanish "*National Strategic Plan for coastal protection, considering the effects of climate change*".

1. INTRODUCTION & BACKGROUND

The ***National Strategic Plan for coastal protection, considering the effects of climate change (****hereinafter, National Strategic Plan),* funded by the European Union's Structural Reform Support programme and implemented in collaboration with EUCC and its partners, and the European Commission, aims to provide a coherent approach at the national level, to ensure regional harmonisation and the application of the most appropriate coastal protection measures for the entire Spanish coast. This encapsulates all actions for the management and protection of the coast that fall within the competencies entrusted to the Ministry for the Ecological Transition and the Demographic Challenge (MITECO), Directorate-General of the Coast and the Sea (DGCM), mainly in relation to the management of the risk of coastal erosion, but also seeking synergies with flood risk management and incorporating adaptation to climate change.

In the first phase of the preparation of the National Strategic Plan, the **Integrated Diagnosis** was completed to identify and characterize the key issues related to coastal protection and management carried out by the DGCM.

Once the diagnosis phase was completed, the first step of the proposal phase of national actions for the management and protection of the coast was addressed, which consisted of defining the **strategic and specific objectives** of the National Strategic Plan, which derive from the critical themes, cross-cutting subjects and the key issues identified in the diagnosis phase, based on a clearly defined vision, mission, and overall objective.

Specifically, the **main objective of adaptation to climate change** is consistent with one of the cross-cutting subjects identified in the Integrated Diagnosis (climate change). To this main objective, **seven strategic objectives** were defined, as follows:

1. Review of the Maritime-Terrestrial Public Domain (DPMT).
2. Improvement of the governance framework.
3. Restoration of the sedimentary balance.
4. Recovery of the coastal natural elements.
5. Managed realignment.
6. Post-event recovery and review.
7. Strengthening the capacity to understand.

On the other hand, forty-seven specific objectives are established in order to address each of the key issues identified through the SWOT analysis of the Integrated Diagnosis, in order to, specifically, correct eleven weaknesses, reduce eighteen threats, enhance ten strengths and promote eight opportunities.

All these objectives are aligned with **the vision** of the General Directorate of the Coast and the Sea (DGCM), which aims to increase the naturalness of the coast on the Spanish coast and thus favour the **natural resilience** of the coastal physical environment as a fundamental means for the **prevention of the risk of coastal erosion** and **for adaptation to climate change**. Thus, the protective function of coastal ecosystems over permitted assets and uses is enhanced while increasing the biodiversity and richness of the natural environment (natural capital).

The **mission** of the *National Strategic Plan* is to **guide decision-making** to order the actions to be carried out by the DGCM at the national level during **the current management cycle**, from now (reference year 2022) **until 2045**, within the framework of its competences for the **management of the risk of coastal erosion** (coastal protection), maximizing synergies with **flood risk management** and incorporating **climate change adaptation**.

Throughout the preparation of the *National Strategic Plan* a group of international experts contributed with national views and provided relevant experiences for coastal protection and management from other countries that are suitable and replicated in the Spanish context.

The objective of this contribution from international experts was to describe and review their practical experiences and identify strategies, measures, and practices to prevent or manage coastal processes at a regional and national level for different types of coast represented in Spain. Therefore, the selected international practical cases were aligned with the **Integrated Diagnosis** and provided significant practical knowledge. The information collected was prepared in the context of the entire spectrum of coastal protection measures and highlighted the relationship between ICZM and land-sea interactions. A review of these practical experiences of coastal protection management formed the basis of the work and fed into the development of the activities in the *National Strategic Plan*, in particular the **methodology for the selection of courses of action**. For this purpose, the revision of the international cases provided recommendations for the definition of the **forty-seven specific objectives** and their respective programmes of measures which are an integral part of the final *National Strategic Plan*.

This present document is the summary of the **relevant lessons learned and recommendations** related to the achievement of the **seven strategic objectives** specifically based on existing practices from selected case studies from France, Italy, Portugal, Ireland (and UK), and The Netherlands.

Therefore, hereby under each strategic objective, relevant lessons learned and recommendations from existing practices from selected case studies from France, Italy, Portugal, Ireland (and UK), and The Netherlands are listed, aiming to support the implementation of the *National Strategic Plan*.

The national case studies that contributed to the findings and recommendations included in this report and with particular relevance for the Spanish context aimed to provide MITECO with a range of practices and experiences from which lessons can be learned from the practical level of coastal erosion and following management considering the effects of climate change.

The selection of the case studies was based upon a variety of criteria, aiming to obtain a representative picture of the coastal diversity of the coastal Member States described and these were as follows:

France:

- Atlantic Coast: highly dynamic and commercial/industrial coastline, vulnerable to climate change - Enhancing resilience to climate change in coastal areas: climate change strategies at the local/ municipal and department levels in France – good practices (La Rochelle, Vendée, Ile-de- Ré, Châtelaillon-Plage; Loire Delta)
- Mediterranean Coast: highly urbanized and touristic coastline - Local stakeholders' engagement in coastal management in highly touristic and urbanized coastal areas in the Mediterranean (Provence-Alpes-Côte d'Azur - the Var area)

Italy:

- River delta managed realignment (Ombrone River delta, Tuscany); few cases of managed realignment in Sardinia; use of geotextile sand containers as a soft defence measure (several spots in Tuscany)
- Sand by-pass options in a littoral cell characterized by strong human pressure (Northern Tuscany); use of gravel in addition to sand in particular conditions

Portugal:

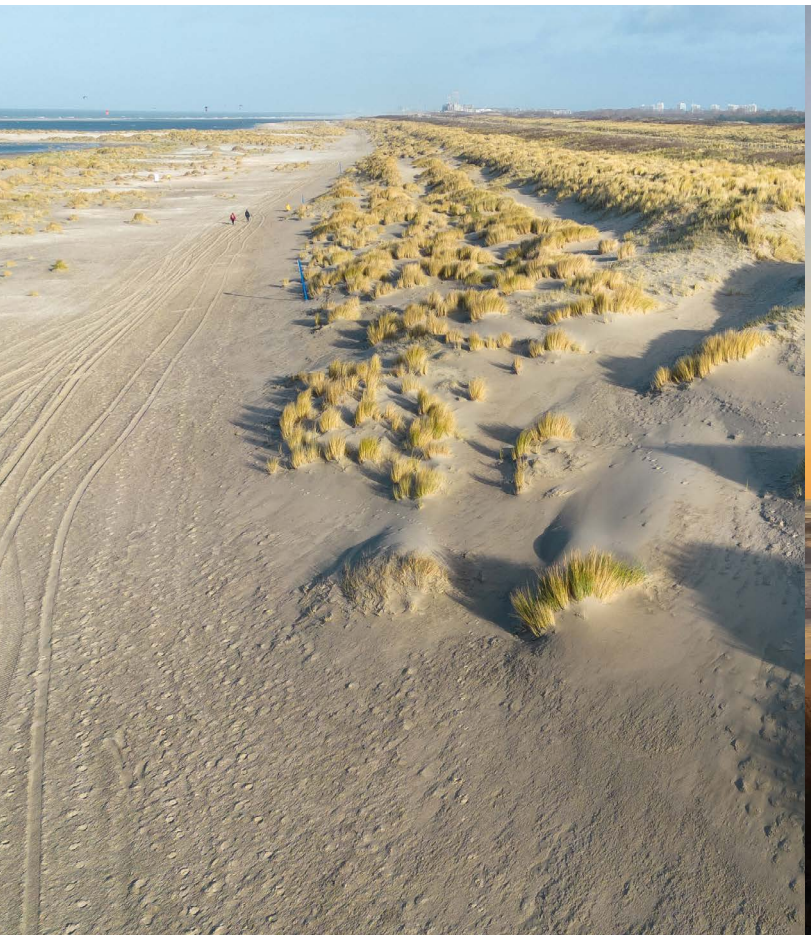
- 'Polis Litoral Norte' Programme
- Restructuring, Requalification, and re-naturalization of the Barrier Islands in the Algarve

Ireland and UK:

- Coastal Protection on Ireland's Atlantic Coast – focusing on Rossnowlagh Coastal Protection – EUROSION Case Study, and Kerry – CONSCIENCE Case Study
- Managed re-alignment projects in two ecologically sensitive areas in the UK

The Netherlands:

- Building with Nature (BWN) - Climate Change Adaptation Strategies – dynamic coastline management to prevent risk of flooding and sea level rise in the Dutch coast
- "Western Scheldt estuary (Dynamic Delta) – sediments management approach in a delta (EUROSION Case Study)



2. LESSONS & RECOMMENDATIONS TO SUPPORT STRATEGIC OBJECTIVES DEFINED IN THE SPANISH NATIONAL STRATEGIC PLAN

The review of the international case studies resulted in a list of lessons and recommendations that aim to support the future implementation of the National Strategic Plan and these are presented to underpin the achievement of the strategic objectives and their respective programmes of measures as defined in the Spanish *National Strategic Plan.*

2.1 Review of the Maritime-Terrestrial Public Domain (DPMT)

The international experts consider that this strategic objective should contribute in an essential way to the rational management of exposure to coastal erosion, in order to promote coastal resilience by enhancing the natural features in the coastal strip, in harmony with land use compatible with existing coastal threats. This should occur in accordance with the current legislation and through a managed retreat process of the coastline.

Lessons & Recommendations:

- Review the DPMT demarcation and legal definition to assess the extent of inconsistencies along the coastline, based on the best up-to-date data/information available either collected from monitoring campaigns and/or from the existing data and information at the DGCM departments
- Coordinate with Maritime Spatial Planning (MSP)[1] process that encompasses the maritime and coastal public domains for promoting protection and resilience of land-sea interaction areas. Given the cyclicity of the MSP process under the EU Directive establishing a framework for maritime spatial planning,[2] the Spanish MSP will be evaluated and updated every 6 to 10 years, that provides a base for monitoring, evaluating and updating the coastal protection strategy in view of the effects of climate change

1 https://maritime-spatial-planning.ec.europa.eu/countries/spain
2 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0089

- Make use of the existing data infrastructures for the coastal and marine domains, such as the European Marine Observation and Data Network (EMODnet) providing Europe's *in situ* marine and coastal data, and of human activities (EMODnet Human Activities)
- Establish a regular programme to collect data and information into a GIS database of the occupations and permits. For this also contribute to and make use of the data and information at the European Blue Economy Observatory[3] that focuses on socio-economic components of the maritime related sectors, such as coastal tourism, and it provides a detailed picture of coastal activities, with latest data, scientific evidence, insights, market information and findings supporting ongoing trends and developments
- Establish a shoreline evolution monitoring plan including annual (and/or as frequent as possible) measurements to support understanding the changing physical conditions. Organize it under the monitoring framework to allow for continuous and long-term monitoring and evaluation
- The shoreline evolution monitoring should use satellite techniques (faster and cheaper) with high-resolution satellite imagery as frequently as possible. Prepare details on cost-benefit analysis of this technique and other available techniques, and how to finance the implementation of it. In due time, consider deployment and increased use of other techniques, such as digital elevation models (DEMs) of improved resolution and elevation accuracy, airborne light detection and ranging technology (LiDAR), unmanned aerial vehicle (UAV) optical photogrammetric surveys, as well as developing techniques, such as drones
- Set-up a plan to revise the administrative procedures required for the demarcation of DPTM (linked to the governance framework recommendations)

3 https://blue-economy-observatory.ec.europa.eu/index_en

- Encourage construction technology for removable and low-cost/environmentally friendly structures for seasonal occupations in the public domain areas
- Reallocation of activities and uses on the coastal zone and promote the resettlement of permanent activities to higher areas in order to avoid the risk of erosion and flooding

2.2 Improvement of the governance framework

This strategic objective should aim to strengthen the planning capacity as well as to improve the institutional communication and participation.

Lessons & Recommendations:

- Strengthen the knowledge bases for managing the effects of erosion and for planning, through the development of governance strategies and information sharing, starting from "good practices" (including learning from unsuccessful experiences), at the various institutional levels
- Establish training and capacity-building programmes for the DGCM staff to enhance governance frameworks, as a follow-up of the national strategic plan. This will strengthen and ensure that the DGCM staff will be well-prepared to monitor the implementation of the programmes of measures endorsed in the *National Strategic Plan*
- Undertake more detailed mapping of governance framework of central, regional, and local governments with clear roles and competencies supporting the implementation of the *National Strategic Plan*. This takes time, but once achieved facilitates collaboration between government levels and facilitates stakeholder engagement as a means to identify gaps and efficiencies

- Examine governance arrangements to identify where this expertise exists and how processes can be amended to incorporate the experience into the coastal protection context
- Develop a central web-based repository with linkage to the regional and local levels for designs and plans to be made easily accessible to the public
- Create multi-stakeholder fora that can cooperate to optimise available resources – many CSOs, NGOs, and other stakeholder groups can make a valuable contribution, which is most impactful when coordinated with other actors. Also important that all actors understand the roles and contributions of others
- Conduct a needs analysis as the basis for staff training – and implement training across scales and sections within organisations to encourage a more integrated approach to implementing the measures of the *National Strategic Plan*
- Definition of clear strategic objectives and joint-vision must be linked directly to a long-term funding approach that guarantees political backing and ensures that financial resources are committed in practice

2.3 Restoration of the sedimentary balance

This strategic objective should aim to reduce as much as possible the imbalance between sediment inputs and losses in the coastal system as well as increase coastal resilience by restoring the sedimentary balance, allocating spaces necessary for natural morphodynamic processes (taking into account sea level rise, climate change, and related extreme events).

Lessons & Recommendations:

- Consider the baseline assessment from this *National Strategic Plan* for restoration of the sedimentary balance as well as, the assessments and methodologies developed in the regional strategies for coastal protection which incorporated the effects of climate change in the Balearic Islands and in Cádiz, Málaga, and Almería

- Robust long-term monitoring is critical to understand the complexity of the coastal system and related processes. Study possibilities of the establishment of such robust long-term monitoring in terms of establishing a framework for it, incentives, resources and funding
- Initiate a study to assess the quantity and quality (grain size, petrography and colour) of sediment available for beach nourishment (in the river basin, coastal zone, and continental shelf) and shelf/slope conditions for sand dumping and circulation in the coastal zone (and consider scheduling subsequent evolution surveys). It is important to consider that continental shelf deposits are made of relict sand which is a non-renewable resource. Thus, in order to manage it, a census of deposits is necessary as well as a medium-long-term policy for coastal protection with beach nourishment
- Designate areas for sand extraction and establish an information base. If possible, create areas where space is available for nature-based solutions. These solutions are based on a design philosophy in which natural processes deliver a number of benefits, such as protection against flooding and coastal erosion, and opportunities for nature and recreation. A way to do this is to be provident, limiting as much as possible the built-up areas in the coastal zone in order to preserve the natural territorial and landscape characteristics in which local communities live thanks to the economic activities linked to the delicate transition ecosystems between the sea and the land
- Incorporate financial incentives for the above type of interventions in the *National Strategic Plan*. For example, activities of sediment bypassing from artificial basins/dams in order to increase the resilience of the infrastructure, the volume of water stored (essential during heat waves) for clean energy production and the sediment input to the connected coastal environment
- Beach nourishment and sediment management should be used to bring the beach system to equilibrium (a sufficient sediment volume in order to reduce risks of flooding and infrastructures damages), rather than relying on the capture of natural sand around new structures. Strengthen this approach in trainings, capacity building, and community information activities
- Find innovative but effective ways to deal with climate change uncertainties including using improved knowledge and monitoring abilities to support adaptive management. Learn from experiences from other countries which successfully implement adaptive management of their coastlines

- Develop coastal vulnerability assessments that will inform policy makers on the possible impacts of climate change on sea level rise, and wave and storm surge conditions, and assist flood defence managers to take appropriate measures (e.g. early warning systems)
- Develop frameworks and methods at different scales (local, national) to strengthen local stakeholders' capacities to increase their involvement in implementation as well as conduct monitoring and evaluations
- A good lesson learned in beach and dune protection is to invest in environmental education of local stakeholders (beach establishment managers, lifeguards, tourist and environmental guides, restaurant and hotel owners, beach cleaning operators etc.) about the importance of dune preservation. As soon as these groups have learned valuable lessons they are in an ideal position to disseminate their knowledge to tourists and end users, with a natural spreading effect (word of mouth)

EUROSION legacy recommends "Sediments & Space for Sustainability"

The EUROSION study[4] *Living with coastal erosion in Europe* introduced the concept of coastal resilience, particularly important in light of the expected effects of climate change, depending on two key factors: "Sediments and Space for Sustainability".

In summary, coastal resilience, i.e. the ability of the coastal system to adapt to changing conditions, decreases as a result of:

- chronic loss of sediments;
- limitations imposed on the space required by the morphodynamic processes;
- natural retreat of cliffs and sedimentary systems;
- redistribution of sediments as a result of retreat.

4 Eurosion (2004). Living with coastal erosion in Europe: Sediment and Space for Sustainability. A guide to coastal erosion management practices in Europe. Brussels. Directorate General Environment. European Commission. www.eurosion.org

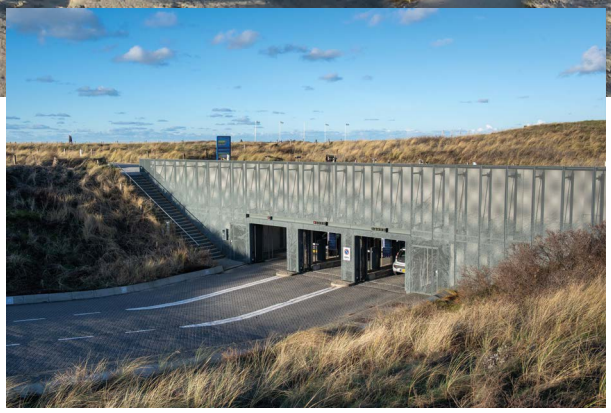
These principles have been the genesis of the methodology and approach to selecting and providing international EU practices to support the Spanish *National Strategic Plan* and therefore it is relevant to mention and recall the key aspects and recommendations of this European-wide study. Other more recent studies have built upon and promoted the findings of the EUROSION study such as the recent policy brief (2022) from the international workshop on the adaptation of coastal areas to climate change, which aims at addressing issues relating to adaptation to climate change in coastal areas, including such considerations as how to work with nature.[5]

Lessons & Recommendations:

The aspects such as **sediments and space** must be recognized as fundamental conditions for sustainable coastal planning in general and for the management of the shoreline in particular, as also underlined by the Protocol on the integrated management of coastal zones of the Mediterranean (UNEP / MAP / PAP, 2008). It is important to take into account the necessary space, to be left or recreated, to "allow" the coastal natural processes to be carried out without causing damage to natural or anthropogenic structures. In this regard, a clear reference is provided by the Protocol itself.

Alongside this aspect, it is of fundamental importance to identify and evaluate appropriate sources of sediments, "strategic reserves of sediments" defined as volumes of sediments, characterized by certain volumes and appropriate textural, mineralogical, and chromatic characteristics, available for the nourishment of coastal areas, both temporarily (to compensate for losses due to extreme events) and in the long term and identifiable in offshore deposits (continental shelf), in coastal areas above or below sea level, and along hydro-graphic basins. Once these strategic reserves have been identified, characterized, and designated, their availability should be ensured by an exclusive use destination for the coastal sedimentary balance.

5 Information available at https://www.conservatoire-du-littoral.fr/252-presidence-francaise-de-l-union-europeenne-2022.htm



2.4 Recovery of the coastal natural elements

This strategic objective should aim to recover and ensure that the coastal natural elements exercise their protective function, it is essential to preserve their good condition. However, for decades, the extensive exploitation of the resources has posed a serious threat to the integrity of the coastline. As a result of these anthropic pressures, the natural resilience and resistance of the coastal system have been diminished in a way that, presently, its fragility is extreme in face of the new threat of climate change.

Lessons & Recommendations:

- Recognize and quantify the ecosystem services offered to the community and its economic activities by a dune/beach/banquette (*Posidonia oceanica)* system, the loss of economic services resulting from the physical and biological alteration of the area and how interventions such as those proposed for restoration can maintain and enhance these services could constitute an innovative and qualifying element (natural capital accounting)

- Conduct systemic and localised risk and vulnerability assessments, feasibility assessments and evaluations of erosion hazard for the comprehensive understanding of risks and vulnerabilities with informed design, decision and implementation of protection measures that are shared among stakeholders with the high consideration of the coastal natural elements
- Consider and where appropriate apply nature-based solutions for societal/infrastructure resilience and nature co-benefits: take action to scale up such solutions, including facilitating dialogue to help change entrenched views in current practices
- Promote the implementation of nature-based solutions that utilize natural processes to deliver flood risk and coastal erosion management whilst enhancing ecosystem services allowing for both climate adaptation and mitigation
- Enhance the restoration of local beach/dune ecosystems which generate natural capital and reduce local vulnerabilities to climate risks such as coastal erosion, coastal flooding, defence of agricultural areas behind the dunes, etc. As a result, this promotes a healthy environment and job opportunities for the local economy

2.5 Managed re-alignment

This strategic objective should focus on the removal of the defence structures that do not offer protection to highly vulnerable populations.

Lessons & Recommendations:

- Prioritise the implementation of sand/gravel and soft-based solutions. Meaning to consider the softest possible solutions (as compared to hard solutions based on structural interventions). Examples are mechanical re-introduction or re-alignment of beach sand, nourishment, construction or protection of sand dunes, management of public use, and engagement of local communities
- A full(er) understanding of the value and connectivity between ecosystem services can be a powerful tool in planning for coastal protection – the benefits of certain protection measures such as managed re-alignment could be better progressed using this approach (e.g. in the case of UK case studies new business and amenity opportunities that followed the abandonment of hard / fixed defences)
- Emphasis should be placed on adaptive management – learning from past experiences and structures that no longer offer protection – the web-based repository as an information-sharing platform would be useful to support implementing actions to apply managed re-alignment
- Set-up programmes of action and consider innovation options for the conservation of the natural environment that is maximised through technological development
- Incorporate the considerable innovation is taking place in various fields of coastal protection both related to soft protection and hard protection solutions
- Stock up on knowledge about the dynamic processes of the socio-economic system of the coast is crucial for successfully finding new avenues to adopt

2.6 Post-event recovery and review

This strategic objective should have the purpose of analysing the consequences of erosive events, when they occur, to stabilize or improve the affected elements and avoid the same damage in future occurrences.

Lessons & Recommendations:

- Post-event monitoring can assist in context setting for extreme events, e.g. where considerable sediment is lost after a single extreme event, which heightens concerns/calls for immediate action, but within a relatively short period of time when recovery can be demonstrated and the situation is not as severe
- Human activity and interference that can exacerbate the impact of erosion should be curtailed – preferably through engagement with stakeholders, including economic sectors and local communities, to better inform them of the consequences of their actions, but regulatory intervention should not be discounted
- Make the responses to coastal erosion accountable through a planning approach based on principles of responsibility, which can favour the optimization of investment costs in relation to the value of the assets at risk, the social acceptability of the shares and leave other options open for the future
- Catalogue and characterise (including costs) measures to provide those tasked with coastal protection a list of options available and suited to their circumstances
- Ensure follow-up with stakeholders following response to erosion events including the implementation of protection measures – these learnings can then be used to improve processes and their application to other sites/situations

- Adopt “full life-cycle” cost analysis for needed interventions to ensure better knowledge of the funds required, including unforeseen events
- Explore Public/Private Partnership models in order to share beach recovery and nourishment costs post-erosion events

2.7 Strengthening the capacity to understand

This strategic objective should aim to seek, firstly, to improve the understanding of the features and functioning of the coastal system as a whole with associated challenges (i.e. due to climate change, including increased extreme events and sea-level rise), consequently improving the capacity to rationalize the interventions on the coastal system and align them with the functions and permitted uses of the coast.

Secondly, this objective should contribute to increasing the public´s perception of the complexity of the coastal system, as well as its threats and risks, while encouraging a greater appreciation and valorisation of the natural elements of the coastal system.

Lessons & Recommendations:

- Communicate, engage and inform the wide range of coastal stakeholders and the public in general in a tailor-made manner about the value of ecosystem services in coastal areas to improve understanding and its potential
- Early engagement with users and relevant coastal stakeholders to facilitate structured inputs that will benefit the progress and implementation of the selected measures
- Set-up campaigns/platforms for information sharing - stakeholder engagement actions - that may support minimizing the pressures and raise common understanding. It is crucial to increase public awareness and involvement of local and other stakeholders in the process, as well as the inclusion of local (often tacit) knowledge
- Systematic information sharing and consulting with experts and stakeholders is key, experts from many different fields can provide multi-disciplinary advice
- Organize capacity-building activities and awareness-raising campaigns to build policy/decision-makers and populations' capacities to collect, exploit and interpret data and projections on erosion hazards at scale
- Raising awareness with the dissemination of accessible, understandable, and actionable scientific knowledge is the way forward to gain support for the *National Strategic Plan*

Notes