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Global SWAP Protocol with specifications for each of the two pilot areas

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Authors' Disclaimer: This deliverable is a planning document to support the testing of the SWAP method during June 2025- April 2026 in each pilot area. Two pilot case studies, along with additional resources, will be included in the INCORE-MED toolbox (Output 4.1) to support adoption processes in other coastal and marine areas.



Contents

Executive Summary	7
1 PILOT AREA: OLBIA GULF, NORTH SARDINIA (ITALY)	10
1.1 Introduction of the Sardinia pilot	11
1.1.1 Objective of the Pilot Case	11
1.1.2 Context and Scope	11
1.1.3 Alignment with Strategies	14
1.1.4 Expected Outputs	14
1.2 Phase I – Preparation	15
1.2.1 Governance, Roles, and Team Building	15
1.2.2 Team composition	15
1.2.3 Expertise	16
1.2.4 Work Plan & Monitoring	18
1.2.5 Stakeholder Mapping & Engagement	19
1.2.6 Knowledge Base	21
1.2.7 Climate Risks & Catalogue of Measures	23
1.2.8 Facilitation Resources & Techniques	25
1.2.9 Ethics in Data and Participation	27
1.3 Phase II – Scenario Workshop	28
1.4 Scenario Making: Processes & Techniques	28
1.5 Phase III – Building the Pathways	29
1.5.1 Selection, Prioritisation & Evaluation	29
1.5.2 Tipping Points Co-design Workshop	31
1.5.3 Modelling Techniques & Process	32
1.5.4 Feedback to Participants	32
1.6 Phase IV – Adaptation Pathways Workshop	32
1.6.1 Modelling the Pathways	33
1.7 Phase V – Validation, Integration & Dissemination	34
1.7.1 Final modelling and integration of results	34



1.7.2	Final Validation with Stakeholders and Municipal Authorities	34
1.7.3	Public Dissemination Event.....	35
1.7.4	Media Strategy	35
1.7.5	Climate Adaptation Strategy and Co-Design Document	35
2	THE PILOT AREA: COASTAL PROTECTION & MANAGEMENT PLAN, CATALONIA	37
2.1	Introduction to the Catalonia pilot.....	38
2.2	Phase I: Preparation.....	40
2.2.1	Governance, Roles, and Team Building.....	41
2.2.2	Work Plan & Monitoring	42
2.2.3	Stakeholder Engagement	46
2.2.4	Knowledge Base	48
2.2.5	Climate Risks & Catalogue of Measures	49
2.2.6	Facilitation Resources & Processes.....	51
2.2.7	Ethics in Data and Participation.....	54
2.3	Phase II: Scenario Workshops.....	55
2.3.1	Production of baseline & alternative scenarios.....	55
2.4	Phase III: Building the Pathways.....	57
2.4.1	Selection, Prioritisation & Evaluation.....	58
2.4.2	Modelling Techniques & Process	59
2.5	Phase IV: Adaptation Pathways Workshops.....	61
2.5.1	Tipping points workshops	61
2.5.2	Modelling the Pathways	62
2.6	Phase V: Validation, Integration & Dissemination	63
2.6.1	Validation events	63
2.6.2	Final Outputs.....	64



List of Figures & Tables

Figure 1: SWAP breakdown structure. Source: Alves (2025).....	9
Figure 2: Extract of sub-area MO/7 from the Italian MSP plan. Source: SID Portale del Mare (2025)	13
Figure 3: Core implementation team. Source: Authors' (2025).....	16
Figure 4: Gantt chart. Source: Authors' (2026).	19
Figure 5: Workflow chart. Source: Authors' (2026).	19
Table 1: Summary of participation sessions, including period, format and topics. Source: Authors' (2025).....	26
Table 2: List of organisations of the Steering Group.....	47
Table 3: Catalogue of Adaptation Measures	50
Table 4: PPOL's participatory process structure (inc. SWAP).....	53



Abbreviations

CBA	Cost-Benefit Analysis
CIIRC	International Centre for Coastal Resources Research
CC3AP	Catalan Coastal Adaptation Pathways
DGCP	Directorate General Coastal Policies (Government of Catalonia)
DMP	Data Management Plan
DOP	Document of Objectives and Proposals
EU	European Union
E-U	eco-union
FC	Facilitation company
FAIR	Findable, Accessible, Interoperable, Reusable
ICZM	Integrated Coastal Zone Management
IPCC	Intergovernmental Panel of Climate Change
IUAV	Iuav University of Venice
MCA	Multi-Criteria Analysis
MPA	Marine Protected Area
MSP	Maritime Spatial Planning
PPOL	Coastal Protection & Management Plan
RAS	Regione Autonoma della Sardegna
SRACC	Sardinia Regional Climate Change Adaptation Strategy
SEC	Socio-economic Consultancy
SSP	Shared Socioeconomic Pathway
SWAP	Scenario Workshop and Adaptation Pathways



Executive Summary

The Global SWAP Protocol establishes site-specific documents for the two pilot areas that adopt the Scenario Workshop with Adaptation Pathways (SWAP). The document describes how the SWAP method is adapted to support **marine adaptation planning in North Sardinia** and **coastal adaptation planning in Catalonia**. It outlines the institutional arrangements, methodological procedures, and participatory processes used to co-design adaptation pathways in each case. The result of this adoption process is the development of an adaptation pathway strategy for each pilot area (Output 3.2) to be delivered before March 2027.

The SWAP - Scenario Workshop and Adaptation Pathways – is a mixed-methods participatory action-research methodology that emerged from the European BASE EU FP7 project¹, which piloted participatory approaches for climate adaptation across Europe. Adaptation pathways are taking place as an institutionalised planning practice to combat coastal climate risks². Adaptation pathways help structure decisions over time by identifying sequences of adaptation actions and transition points under uncertainty. Recent literature on adaptation pathways³ emphasises the use of this planning method to improve decision-making under deep uncertainty by fostering flexibility, avoiding maladaptation and costly regrets, and enhancing stakeholder co-learning and long-term adaptation capacity. The novelty of SWAP as a participatory design lies in overcoming the lack of meaningful stakeholder engagement throughout the co-learning process. The SWAP brings a participatory design that combines the Scenario Workshop method, emphasising participatory scenario co-creation with stakeholders, and the Adaptation Pathways approach, while integrating scientific modelling with participatory multi-criteria and cost-benefit analysis. INCORE-MED supports the SWAP method by focusing on the transfer and adoption process.

The Global SWAP Protocol is the first outcome of transferring this planning method to the two pilot areas. In Catalonia, the General Directorate of Coastal Policies of the Government of Catalonia, an INCORE-MED associate partner, is the beneficiary and adopter of the planning method and is integrated into the planning process of the Coastal Protection and Management Plan (PPOL). The PPOL team also includes subcontracted facilitator and researcher teams. eco-union also adopts the SWAP in Catalonia, closely supporting the PPOL team with regular progress monitoring, observation and analysis of processes and activities, active participation in decision-making, and leading the documentation of the SWAP process. In Sardinia, the SWAP method is

¹ BASE (Bottom-up climate Adaptation Strategies towards a Sustainable Europe, 2012-2016): <https://base-adaptation.eu/>

² Werners et al. (2020, p. 269): <https://doi.org/10.1016/j.envsci.2020.11.003>

³ Werners et al. (2020) <https://doi.org/10.1016/j.envsci.2020.11.003>;

Haasnoot et al. (2024) <https://doi.org/10.1016/j.gloenvcha.2024.102907>



tested in a coastal and marine area of high ecological, socio-economic, and governance relevance, extending from the Maddalena archipelago to the Gulf of Olbia. In this pilot, the SWAP is adopted by the Regional Authority of Sardinia within a cooperation agreement involving a marine research centre and in collaboration with the University of Venice (IUAV). Both pilot areas constitute a community of practice through which co-learning emerges and helps establish networked replication processes in other coastal and marine areas. This is a key adoption condition for implementing SWAP as a multidisciplinary planning method and, where it resides, the added value of INCORE-MED as a territorial capacity-building project. Furthermore, it is through the community of practice, including the stakeholders participating in the process, that climate adaptation is established as a flexible, long-term territorial approach.

Mentorship and facilitation have emerged as critical capacities that support adoption processes, as SWAP is a multidisciplinary, multi-method participatory planning practice that requires strong guidance skills throughout the full co-design process of adaptation pathways. There are many interrelated factors affecting flexible climate adaptation planning⁴, such as the complexity of consensus in multi-stakeholder environments, knowledge uncertainties in anticipating climate futures, governance misfits, low and fragmented participatory cultures, or difficulties in valuing flexibility. The SWAP transfer through mentorship is led by the association eco-union and its associated consultant, Filipe Alves. Mentorship involves multiple methods, such as progress monitoring, micro-training, review of reports and outputs, and a strong creative mindset to adapt throughout the process and through learning by doing. This architecture is complemented by the Plan Blue association and the National & Kapodistrian University of Athens (NKUA), cooperating with eco-union and the SWAP adopters to support the joint assessment of the transfer and adoption process and to incorporate rich lessons learned. This situated knowledge about participation adaptation planning contributes to enhancing the SWAP readiness as a transferable methodological framework for participatory climate adaptation in Mediterranean coastal and marine spaces. This will be embodied through the INCORE-MED toolbox (Output 4.1).

The production of the planning document is conceived as a first-stage adoption practice to ensure methodological confidence and the necessary scientific, political, and practical alignments with the SWAP method among adopter teams. The pilot area protocols describe the methodological, organisational, and operational framework for the SWAP process, including preparation, stakeholder engagement, knowledge base, climate-risk analysis, scenario building, participatory evaluation of measures, pathway construction, validation, and dissemination. This structure follows a phase-by-phase planning of the SWAP (Figure 1). The workflow is intentionally iterative: each phase builds on the previous one, but results can be revised as new information, modelling outputs, or stakeholder feedback emerge.

⁴ Werners et al. (2020); Hassnoot et al. (2024)

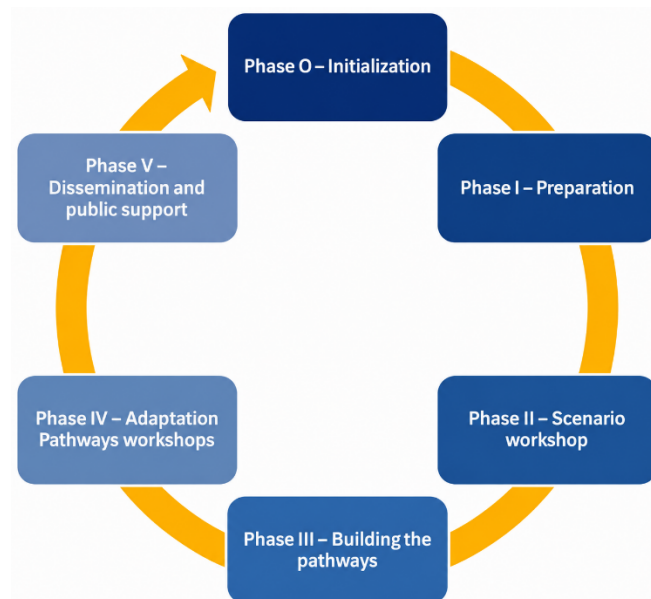


Figure 1: SWAP breakdown structure. Source: Alves (2025)⁵

The expected outputs include a structured knowledge base, a catalogue of adaptation measures, and a set of adaptation pathways to inform future ICZM and MSP processes, as included in the climate adaptation strategies (output 3.2).

⁵ Alves, F. (2025). *Basic Guidelines: Scenario Workshop and Adaptation Pathways*. INCORE-MED Project. Interreg Euro-Med. Eco-union, Barcelona.



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1 PILOT AREA: OLBIA GULF, NORTH SARDINIA (ITALY)





1.1 Introduction of the Sardinia pilot

1.1.1 Objective of the Pilot Case

The strategic objective of the SWAP process in North-eastern Sardinia is twofold. First, to integrate climate adaptation into the new cycle of the Italian MSP Plan, developing knowledge-based spatial and governance solutions to address key risks, namely rising sea temperatures and ocean acidification, which are driving significant biodiversity loss and threatening the resilience of marine ecosystems. Second, to enhance stakeholder participation, ensure that perspectives previously underrepresented are actively included. The process aims to co-produce adaptation pathways aligned with EU Green Deal principles. Defining these objectives and the geographic and thematic scope ensures that all subsequent activities are coherent, focused, and relevant to local needs while remaining consistent with broader policy and legal frameworks.

Conceived as a pilot experiment grounded in stakeholder involvement, the process embeds principles of inclusiveness, transparency, and responsiveness within its methodological design. Inclusiveness is pursued by engaging institutional actors, sectoral representatives, and local communities in decision-making moments throughout the SWAP process. Transparency is ensured through open communication, clear documentation, and the public sharing of workshop outcomes. Responsiveness is achieved by integrating stakeholder feedback into the adaptation of scenarios, tools, and priorities. In this way, legitimacy is not treated as an external requirement but as an inherent characteristic of the project's governance approach.

At the same time, clarifying stakeholder expectations is understood as essential for meaningful participation: participants are informed about the scope of their influence, the nature of expected outputs, and the legal, institutional, and technical constraints shaping decision-making. By making explicit how local knowledge and perspectives feed into scenario mapping, participatory cartographies, and adaptation pathways, the process seeks to build trust, prevent misunderstandings, and frame stakeholder contributions as both valuable and realistically positioned within the planning context.

Accordingly, the objectives of the Sardinian pilot case are:

1. To develop adaptation pathways to climate risks for Sardinia's marine areas, identifying and prioritising measures to inform the next cycle of the Italian Maritime Spatial Plan.
2. To capacitate and mentor the Sardinian Region and MSP competent authorities to integrate the participatory approach into the production of adaptation pathways.
3. To study the adoption process of the SWAP into the MSP planning context.

1.1.2 Context and Scope



Coastal risks, socio-economic drivers and governance context.

Given the extent and heterogeneity of north-eastern Sardinia's coastline, the SWAP adopts a flexible approach, rather than imposing a rigid pre-defined focus area. The preliminary area, stretching from the Maddalena archipelagos (MO/7_08 Italian MSP planning unit) to the Gulf of Olbia (MO/7_14 Italian MSP planning unit)⁶, is a Mediterranean hotspot in ecological and socio-economic terms (Figure 2). The area hosts a dense network of protected sites, including the Maddalena Archipelago National Park, Tavolara-Punta Coda Cavallo and Capo Testa-Punta Falcone MPAs (Marine Protected Areas), different Natura 2000 sites, the Pelagos Sanctuary for Marine Mammals, North-Western Mediterranean EBSA, and the Strait of Bonifacio PSSA.

These habitats are increasingly exposed to rising sea temperatures and ocean acidification, which accelerate biodiversity loss, alter species distributions, and threaten the ecological integrity of seagrass meadows, fish spawning grounds, and other critical ecosystems. Alongside these environmental risks, the region sustains a highly diversified blue economy, as it contains a dense intersection of maritime uses. Seasonal tourism brings nearly four million visitors each summer, around 40% of Sardinia's total arrivals, placing heavy demands on port facilities and coastal infrastructure⁷. Fisheries and aquaculture are equally crucial, providing employment and regional food supply, yet face intensifying pressures due to warming waters, shifting fish stocks, and disease vulnerability.

These combined stressors reinforce the need for operational spatial solutions within the MSP framework to safeguard biodiversity, secure fishing grounds, and identify resilient and low-conflict areas for future aquaculture development. At the socio-political level, MSP in Italy has evolved through a predominantly centralised, state-led planning model coordinated by the Ministry of Infrastructure and Transport, culminating in the formal adoption of the national Maritime Spatial Plans in 2024. Within this MSP framework, the Region of Sardinia holds institutional responsibility for its territorial waters corresponding to sub-area MO/7, in addition to pre-existing regional competences related to aquaculture, regional nature parks, fisheries-related local management, coastal tourism, and certain environmental and land-sea interface policies⁸.

National and regional administrations have jointly led the planning choices. However, the process largely unfolded through institutional and technical channels, with limited integration of local knowledge, lived experience, and fine-grained territorial insight from those directly operating at sea and along the coast.

⁶ Ministero delle Infrastrutture e dei Trasporti (2024). Decreto Ministeriale 25 settembre 2024 , n. 237: Adozione dei Piani di Gestione dello Spazio Marittimo ai sensi del D. lgs. 201/2016 [Ministerial Decree of 25 September 2024, No. 237: Adoption of the Maritime Spatial Management Plans pursuant to Legislative Decree 201/2016]. <https://www.mit.gov.it/normativa/decreto-ministeriale-n-237-del-25092024>

⁷ Regione Sardegna (2024). Sardegna Statistiche. <https://www.sardegna statistiche.it/argomenti/turismo/>

⁸ Ramieri, E., Bocci, M., Brigolin, D., Campostrini, P., Carella, F., Fadini, A., Farella, G., Gissi, E., Madeddu, F., Menegon, S., Roversi Monaco, M., Musco, F., Soffietti, F., Barberi, L., & Barbanti, A. (2024). <https://doi.org/10.1016/j.marpol.2023.105911>



It is precisely this imbalance that the North-Eastern Sardinia pilot seeks to address by mobilising bottom-up and participatory planning methodologies that integrate the perspectives of fishery and aquaculture cooperatives and associations, tourism operators, park authorities, and blue communities⁹. In this way, the pilot is working within the MSP framework, experimenting with governance practices that can enhance knowledge legitimacy, empower local actors, and support climate-resilient spatial decision-making. It is therefore an ideal laboratory for shared problem-identification and cross-sector scenario building.

At the same time, the pilot's spatial perimeter will remain intentionally open. Through workshops, stakeholder involvement, and mapping sessions, participants will collectively refine the geographic boundaries of the working site and identify priority micro-areas where adaptation and mitigation strategies should be tested. This flexibility prevents premature spatial restriction, allows unexpected priorities to emerge, strengthens participants' interpretative capacity, and supports stronger ownership of the outcomes. By enabling the working site to be jointly defined through lived experience, ecological understanding, and negotiated reasoning, the pilot ensures that future spatial interventions and governance measures are not only technically appropriate but politically accepted and place-based.

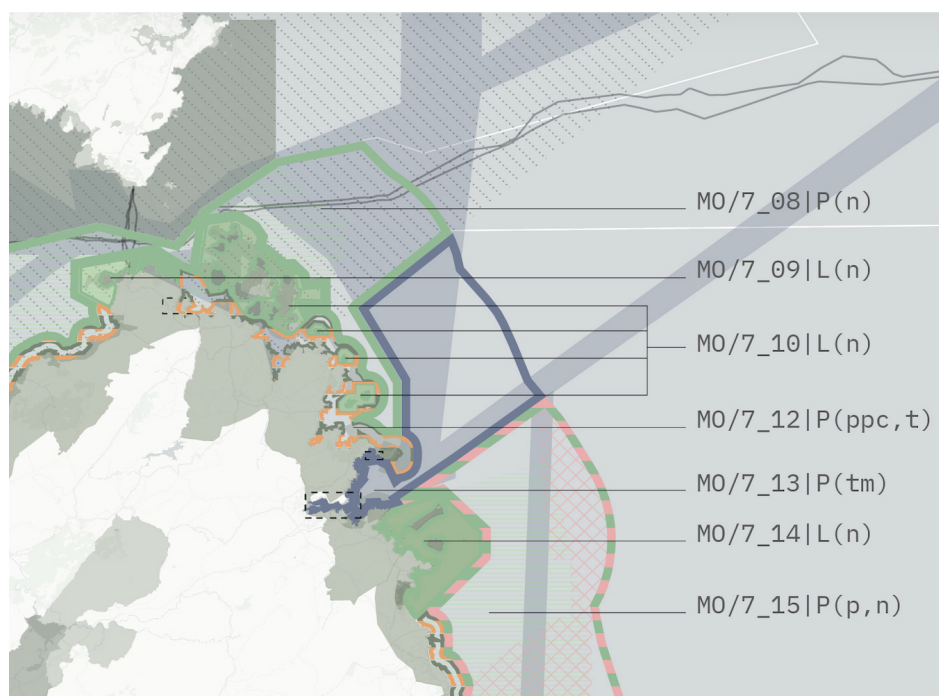


Figure 2: Extract of sub-area MO/7 from the Italian MSP plan. Source: SID Portale del Mare (2025)

⁹ Locally anchored governance models integrating sustainable water management, marine ecosystem restoration, blue-carbon actions and citizen engagement — represent a concrete and replicable approach for strengthening coastal and island resilience.



1.1.3 Alignment with Strategies

National/regional adaptation frameworks, EU policies.

The pilot is firmly anchored in European, national, and regional policy frameworks. At the European level, it contributes to the objectives of the EU Maritime Spatial Planning Directive (2014/89/EU), the EU Strategy on Adaptation to Climate Change, and the European Green Deal, all of which call for science-based decision-making, inclusive governance, and the integration of climate adaptation and mitigation into marine and coastal planning. At the national level, it supports the Italian MSP Plan for the Tyrrhenian Sea, which promotes ecosystem-based management and participatory planning to coordinate maritime uses while safeguarding marine ecosystems. Within this plan, the regional MSP framework for Sardinia's territorial waters in sub-area MO/7 identifies 40 Planning Units and 39 management measures addressing key sectors such as fisheries, aquaculture, tourism, maritime transport, and biodiversity protection. The SWAP methodology will be applied to pilot the participatory implementation of selected actions within these Planning Units and measures, testing how inclusive, knowledge-driven processes can translate planning objectives into concrete spatial solutions that address climate risks such as rising sea temperatures and ocean acidification. At the regional scale, the pilot also advances the Sardinia Regional Climate Change Adaptation Strategy (SRACC), which promotes integrated interventions to reduce climate risks across coastal and marine environments.

1.1.4 Expected Outputs

Shared scenarios, adaptation pathways, and a validated strategic document.

The North-East Sardinia pilot is expected to deliver a set of interconnected outputs that combine concrete planning solutions with process-based outcomes. The expected outputs are i) a comprehensive database of measures to inform the next Italian MSP plan cycle; ii) a database of impacts of those measures (social, economic and environmental); iii) a database of costs and benefits associated with those measures; iv) a Consented vision for the short (2030) and medium (2050) future; v) Adaptation Pathways.

The SWAP process itself is an output, as it will strengthen local capacities for dialogue, negotiation, and collective decision-making. By engaging institutions, maritime sectors such as fishery and aquaculture associations, tourism operators, and community representatives, the pilot will promote a lasting community of practice capable of sustaining participatory governance beyond the project's lifetime. This community-building dimension is essential for ensuring that the strategies developed are not only technically sound but also socially legitimate and implementable within the multi-scalar governance structure of MSP.

The SWAP workshops will lead to the definition of shared adaptation and mitigation pathways, translating scientific evidence and stakeholder knowledge into operational guidance for MSP



implementation. All these outputs, which are negotiated priorities, will be consolidated into a strategic document that captures the agreed scenarios, spatial priorities, and enabling measures. This document will serve as a reference for integrating participatory outputs into Sardinia's regional MSP framework, directly supporting the implementation of selected management measures within the 40 Planning Units of sub-area MO/7. It will also help enhance a knowledge infrastructure that supports maritime adaptation planning.

1.2 Phase I – Preparation

The Phase I - Preparation establishes the technical, social, and institutional foundations for an effective, inclusive, evidence-based, and actionable participatory process. It includes the governance structure, the creation and preparation of working teams, stakeholder mapping and engagement, the development and structure of a knowledge base, and a facilitation plan.

1.2.1 Governance, Roles, and Team Building

The governance of the SWAP process in North-eastern Sardinia is based on a collaborative structure involving the Sardinia Region (RAS) and the IUAV University of Venice. Each organisation contributes complementary expertise that together ensures scientific robustness, institutional legitimacy, and operational effectiveness. The team composition reflects the need to balance coordination, facilitation, stakeholder engagement, and data management within a transparent governance framework.

1.2.2 Team composition

The **Sardinia Region** provides institutional leadership and legitimacy. As the regional authority responsible for Maritime Spatial Planning (MSP), it coordinates the alignment of SWAP with the national MSP plan (sub-area MO/7) and ensures the integration of outcomes into existing policy frameworks. The Region brings extensive experience in MSP processes, ecosystem-based planning, and multi-level governance, having been involved in previous EMFF projects, including MSPMED and REGINA-MSP.

IUAV University of Venice contributes scientific and methodological expertise in spatial planning, climate adaptation, and participatory processes. Building on its role in several EU projects (e.g., ADRIPLAN, SUPREME, MSP-GREEN, AdriAdapt, Adriacim), IUAV leads the design and implementation of participatory cartographies and supports the integration of qualitative and quantitative analyses. The university also ensures methodological alignment with European



adaptation frameworks and manages GIS-based activities.

The Marine Research Centre provides technical and modelling expertise to support the assessment of adaptation pathways through ecological and environmental models. It contributes to data analysis, projections, and evidence-based evaluation of climate risks and adaptation measures.

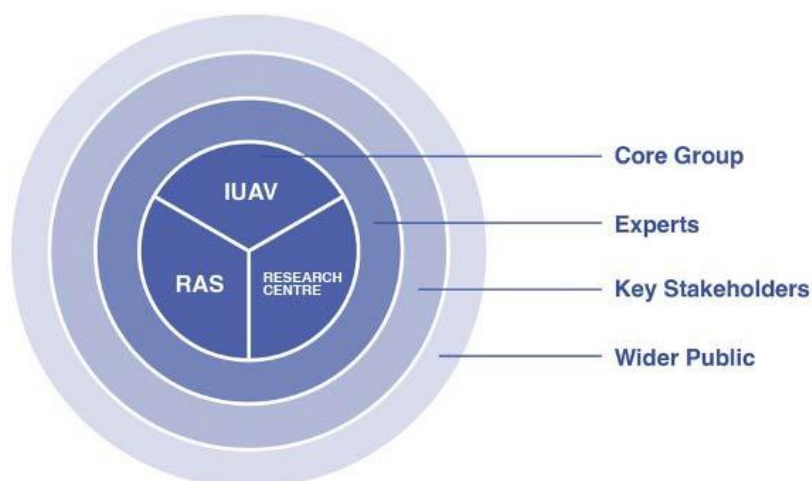


Figure 3: Core implementation team. Source: Authors' (2025).

1.2.3 Expertise

Coordination: The Sardinia Region assumes the primary coordinating role, ensuring institutional legitimacy and political alignment of the SWAP process with the newly adopted Italian MSP framework. Its function is to guarantee that the participatory process is consistent with regulatory requirements, regional development priorities, and sectoral policies. Coordination also involves institutional stakeholders, validation of methodological steps, and a formal framework for the adoption of outputs. IUAV supports this function by providing scientific and methodological advice, ensuring that international standards of participatory governance and climate adaptation planning inform coordination.

Facilitation & Logistics: IUAV leads the facilitation of workshops and participatory laboratories, drawing on its consolidated expertise in stakeholder engagement and spatial planning. This entails designing participatory methodologies, developing facilitation materials, moderating deliberative exercises, and ensuring inclusivity across diverse groups of actors (institutions, economic sectors, and local communities). The Sardinia Region contributes by providing institutional venues and ensuring the visibility and accessibility of the participatory process, ensuring the involvement of local actors in coastal and marine contexts.



Stakeholder liaison: The Sardinia Region acts as the primary institutional interface, leveraging its consolidated network of relations with local administrations, sectoral representatives (fisheries, aquaculture, transport, tourism), and national authorities involved in MSP. This ensures a smooth integration of SWAP within ongoing governance processes. IUAV contributes by bridging these inputs with the methodological requirements of participatory cartography and scenario development.

Data analysis: IUAV is responsible for analysing qualitative data emerging from participatory cartographies and workshop discussions, and for systematising local knowledge into spatially explicit outputs.

Data management: IUAV ensures compliance with the project's Data Management Plan and ethical requirements, adopting protocols that guarantee transparency, accountability, and scientific integrity. This includes the secure storage of datasets, anonymisation of sensitive information, and, where possible, the establishment of open-access formats, following FAIR principles (Findable, Accessible, Interoperable, Reusable). IUAV will also oversee the traceability of participatory outputs (storymaps, narratives, measures), ensuring that all contributions are archived systematically and remain accessible for subsequent phases of the SWAP and for external validation. The Sardinia Region provides access to administrative and policy documents, ensuring that all data layers are integrated coherently.

SWAP governance (internal)

The internal governance of the Sardinia SWAP pilot refers to the organisational arrangements and procedural rules that regulate how IUAV and the Sardinia Region will collaborate throughout the process. The objective is to ensure clarity of roles, transparent decision-making, and ethical handling of all data and participatory outputs.

Internal governance is based on a distributed system of responsibilities:

- The Sardinia Region provides institutional leadership and ensures alignment of the SWAP process with MSP frameworks and regional priorities.
- IUAV coordinates methodological design, participatory cartographies, and data management protocols.

Regarding the decision-making process, rules are taken collectively, following a principle of consensus among partners. Strategic orientations (e.g., scope of workshops, integration with MSP objectives) are validated with the Sardinia Region, while operational and methodological choices are defined by IUAV in coordination with the Region. All decisions are documented through regular meeting notes, ensuring traceability across the project. Transparency is ensured through systematic documentation, open communication among partners, and strict adherence to the project's Data Management Plan (DMP). This includes anonymisation of sensitive data, secure storage of participatory outputs, and compliance with FAIR principles (Findable, Accessible,



Interoperable, Reusable). Ethical principles guide the process by safeguarding inclusivity, informed consent, and the representation of vulnerable groups.

To ensure continuous coordination and alignment across partners, regular online meetings are held: every two weeks with the two Italian institutions, and every three weeks with the WP leader (Eco-Union), facilitating integration with the Catalan case. Within this collaborative framework, each partner contributes distinct expertise. After each meeting within the Italian institutions, IUAV will provide an internal report with the minutes. When SWAP events approach (such as Scenario Workshops, Adaptation pathways, etc), the internal meetings among the two Italian institutions will be held more often (one/two meetings per week), according to specific needs for the elaboration of preparatory materials.

1.2.4 Work Plan & Monitoring

This section outlines the SWAP process designed for North-eastern Sardinia, structured to develop context-specific adaptation pathways that respond to the ecological and socio-economic dynamics of sub-area MO/7 of the Italian MSP Plan. The process follows the sequence proposed by the SWAP methodology, while maintaining flexibility to accommodate evolving data, stakeholder inputs, and political priorities from the Sardinia Region (RAS).

The SWAP process in Sardinia unfolds across the SWAP's six phases aligned with the overall INCORE-MED. Activities formally begin in April 2025 with the initialisation stage and conclude in late 2026 with dissemination and integration into regional MSP processes. The Gantt chart (**Figures 4 and 5**) provides a visual overview of milestones and interdependencies.

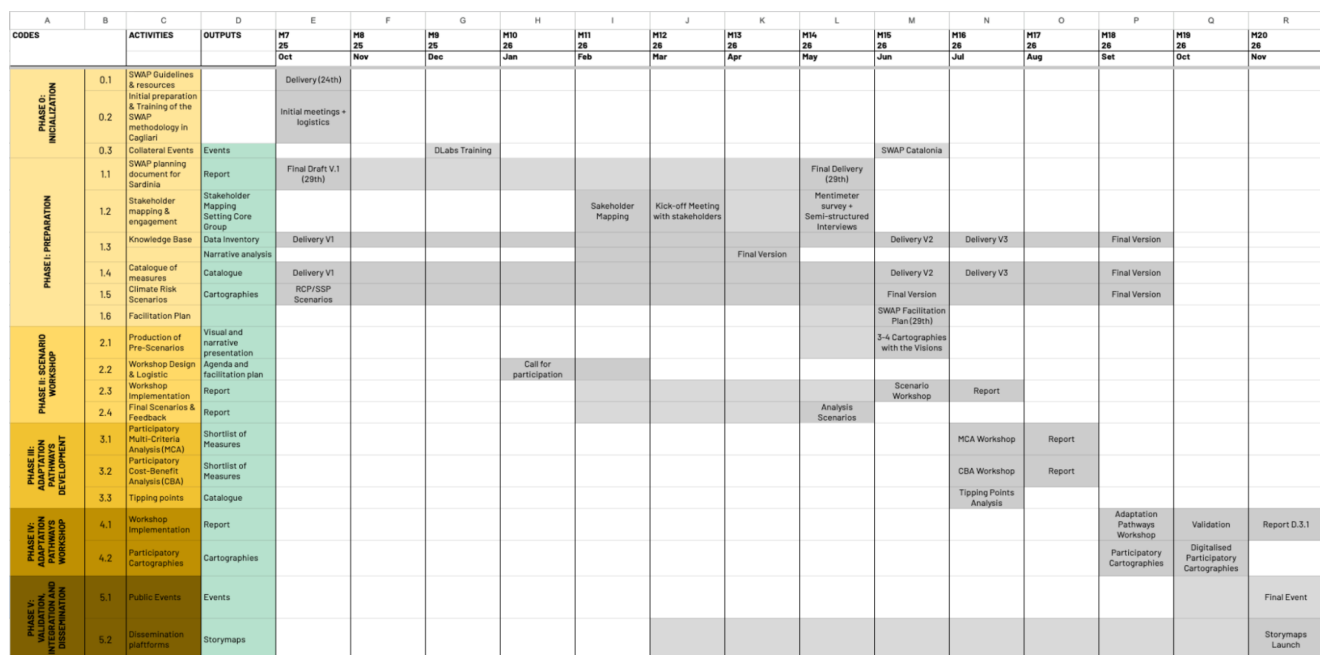


Figure 4: Gantt chart. Source: Authors' (2026).

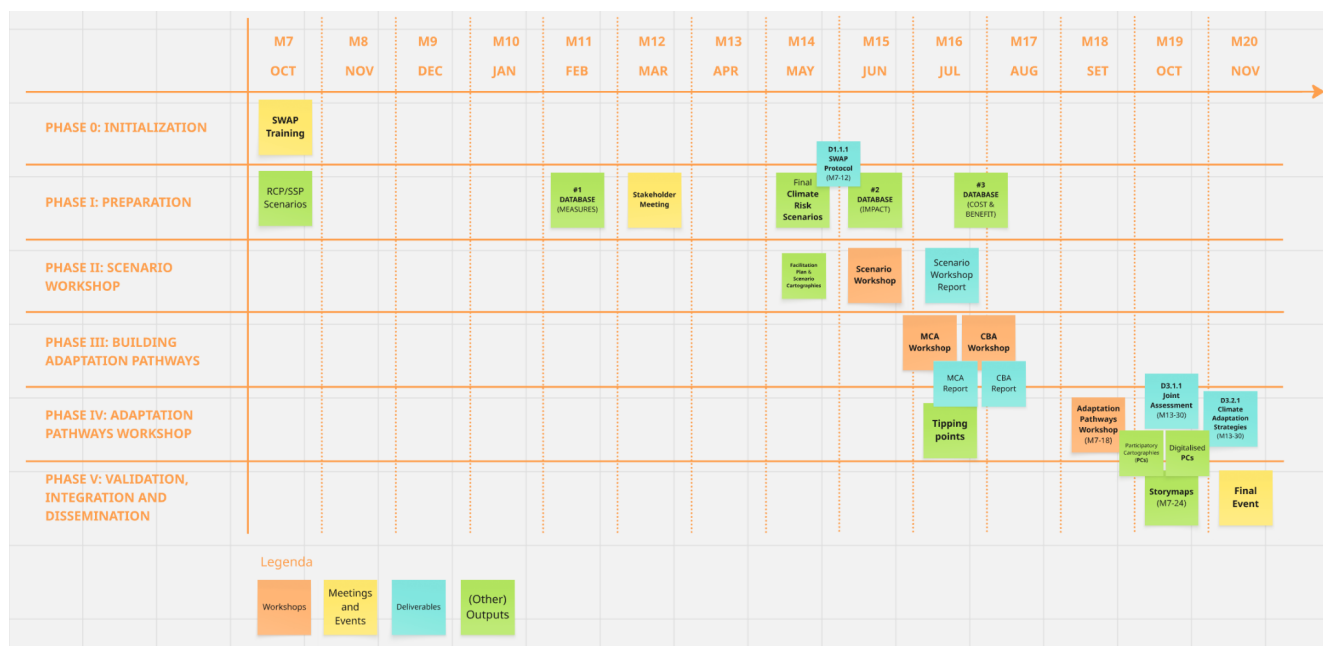


Figure 5: Workflow chart. Source: Authors' (2026).

1.2.5 Stakeholder Mapping & Engagement

Engagement will be structured as a gradual and situated process, combining planned targeted outreach with moments of collective exchange. All listed stakeholders are expected to actively contribute to one or more participatory phases and will be contacted by the Sardinian project partners and invited to participate in the INCORE-MED process. This activity is part of Phase I of the SWAP, conducted according to the guidelines, and is scheduled for the first months till



February 2026.

Stakeholder engagement will follow a structured process. After the configuration of the core group of stakeholders, there will be direct communication with local and regional institutions, followed by the publication of a call for participation on official websites. Interested and identified key stakeholders will then be contacted directly via email and phone. Short bilateral interviews will be organised to clarify expectations, availability, and the perceived relevance of the SWAP process, while also mapping sensitivities, potential conflicts, and levels of trust toward institutional planning. Experts will be involved throughout to validate the methodology and provide guidance: some focusing on ecological and restoration aspects, others contributing experience in maritime spatial planning, adaptation, and broader planning contexts, ensuring that both environmental and governance dimensions are fully addressed.

The process culminated in a **Kick-off Meeting** on the 30th March, conceived as an initial moment to present the INCORE-MED project, its structure within the Interreg Euro-MED programme, its main objectives, and the role of the SWAP methodology, while explicitly highlighting the central role of stakeholders in shaping the process and its outcomes. The session introduced the Sardinian pilot area, explaining the main target risks, together with their implications for marine ecosystems and local socio-economic dynamics, and the role of Maritime Spatial Planning in this context. It also provided an overview of the work developed so far and the upcoming phases, including the Scenario Workshop, clarifying the type of contribution expected from stakeholders and the use of participatory cartographies to integrate local knowledge into the process. A roundtable allowed participants to introduce themselves and position their role within the process, reinforcing both the collective dimension of the process and their active involvement as key contributors.

Following the Kick-off Meeting, the minutes of the meeting were shared with all participants to ensure transparency and allow stakeholders to revisit the main points discussed. The core group then proposed to complement the process with two targeted interviews, and to send a Mentimeter survey in the interim period before the Scenario Workshop. These actions are intended to gather preliminary inputs, support the identification of key challenges, and maintain an active and continuous engagement of the stakeholder community throughout the process.

The wider public is considered a complementary audience to the core group, expertise and key stakeholders. It includes local communities, citizens, and actors from other parts of Sardinia who are not directly involved in the pilot area but may be interested in the process and its outcomes. The wider public will primarily be engaged through dissemination and communication activities, public events and knowledge-sharing tools. This broader engagement is expected to strengthen the institutional MSP process and to foster longer-term uptake of climate adaptation measures beyond the pilot area.



1.2.6 Knowledge Base

In preparation for the SWAP process in North-eastern Sardinia, a preliminary review of scientific literature, policy frameworks, and previous participatory initiatives was conducted, establishing an evolving knowledge base. This assessment is essential for identifying the region's climate vulnerabilities and informing opportunities for inclusive and context-sensitive adaptation planning.

The knowledge base supports the development of adaptation pathways and will be consolidated as an open-access product at the final stage of the process. It also provides the reference point for the catalogue of measures, the multicriteria and cost-benefit analysis of selected measures, and the modelling of tipping points. Given the focus on a broad area in North-eastern Sardinia, the knowledge base must bring together information from multiple fields, such as environmental and social sciences. The knowledge base is composed of four components.

Bibliographic database: The database integrates multiple sources of information relevant to climate adaptation and participatory maritime planning in North-eastern Sardinia. These include:

- Policy frameworks: International, European, and national policies guiding participatory approaches and environmental governance, such as the Aarhus Convention (1998), the EU Maritime Spatial Planning Directive (2014/89/EU), Italy's MSP framework, and the Regional Climate Change Adaptation Strategy (SRACC, 2019).
- Scientific articles: Peer-reviewed research on coastal dynamics, climate risks, participatory mapping, citizen science, and social-ecological vulnerability.
- Reports on past participatory initiatives: Evaluations and documentation of workshops, stakeholder consultations, and community engagement processes relevant to ICZM, MSP, and climate adaptation in Sardinia or comparable Mediterranean contexts.
- Grey literature and media sources: Reports and media coverage that provide insights into public perceptions, socio-cultural dimensions of climate risks, and local adaptation experiences.

Quantitative Climate-risk Database: The knowledge base includes a structured collection of quantitative data on coastal and marine climate risks. This covers the availability of datasets, identified gaps, access pathways, and plans for producing socio-economic and climate-risk models at relevant spatial and temporal scales (e.g., coastal erosion, flooding, water temperature, ocean acidification, and ecosystem responses). Datasets include layers from the study area, besides climate, ecological and socio-economic data.

The knowledge base will integrate multiple datasets to support the assessment of climate risks and impacts in North-eastern Sardinia, covering coastal and marine dimensions. The data collection plan considers availability, gaps, access, and the production of new datasets where



necessary.

The dataset will include general spatial layers describing the study area, such as administrative boundaries, coastal and marine zones, and protected areas. It will also include environmental and ecological information, together with socio-economic layers representing key maritime activities (e.g. fisheries, aquaculture, and other coastal uses). Additional derived outputs may be produced to support the overall assessment and planning process, including indicators of environmental pressure, ecosystem response, and interactions between human activities and the marine environment, based on available information and existing knowledge.

Data will be compiled from a combination of open-access repositories, institutional sources, and national and regional authorities. This will be complemented by stakeholder engagement activities aimed at incorporating local knowledge and context-specific information.

Some components of the knowledge base will be refined and updated throughout the SWAP process to ensure that the most recent data, literature, and stakeholder inputs are incorporated. Also, by documenting gaps and limitations, these reports allow stakeholders to understand uncertainties, support informed decision-making, and guide the planning of subsequent knowledge-generation efforts. To respect the diversity and context-specific challenges of a given location, a wide range of actors must be considered¹⁰. Achieving truly inclusive participation can be challenging due to the need to build trust among stakeholders, potential conflicts, and time constraints - a resource constrained by the pressing need for climate action. Nevertheless, addressing knowledge gaps of local and regional actors in the national planning process as fully as possible is essential, as incomplete information can limit the relevance and legitimacy of adaptation strategies.

To bridge these gaps, activities such as stakeholder interviews, participatory workshops, and geospatial surveys are proposed. For instance, interviews are particularly important, as they allow direct engagement with local actors and capture qualitative insights, perceptions of risk, and contextual knowledge that may not be reflected in existing datasets.

Semi-structured interviews will be conducted with three groups: (A) economic and productive actors such as aquaculture operators, fishers, and tourism businesses; (B) civil society organisations, local associations, and community groups; and (C) public authorities and technical institutions involved in coastal and marine management. The interviews will capture both technical and experiential knowledge, providing local observations of climate impacts, adaptation priorities, and gaps in existing information.

GeoSurvey tools are digital instruments used to collect, analyse, and visualise geospatial data that can enhance these surveys by enabling the real-time measurement and mapping of geographic

¹⁰ Burke, M. J., & Stephens, J. C. (2017) <https://doi.org/10.1016/j.erss.2017.09.024>



features such as polygons and polylines within a geographic coordinate system¹¹. Examples of such tools include participatory GIS platforms like ArcGIS Survey123 or SeaSketch, which facilitate the integration of local knowledge with scientific datasets, supporting more informed, transparent, and socially legitimate adaptation planning.

By systematically organising and updating this knowledge, future interventions can build on a comprehensive understanding of local vulnerabilities and priorities. Collected data and insights can inform iterative planning cycles, guide follow-up participatory initiatives, and support adaptive management.

1.2.7 Climate Risks & Catalogue of Measures

Climate Risks

Climate projections, derived from the collected datasets, will be processed to develop cartographic maps that help visualise and identify the coastal and marine areas most sensitive to climate risks. These maps will provide a spatial representation of exposure across North-eastern Sardinia. The resulting outputs will support the definition and discussion of future scenarios in participatory workshops with institutional and local stakeholders, distinguishing between short- and medium-term planning horizons to inform adaptive decision-making.

Catalogue of measures

The catalogue of measures is developed through an iterative process that combines the climate-relevant measures already included in the Sardinia MSP regional strategy with new measures proposed for the North-east Sardinia pilot. First, existing MSP measures for sub-area MO/7 are reviewed and screened for climate relevance, adaptation/mitigation contribution, spatial vs governance nature, and targeted sectors, providing a baseline for how the current framework addresses key climate risks (e.g., biodiversity loss, rising sea temperatures, ocean acidification).

Based on this baseline, a gap analysis—grounded in scientific evidence, spatial data, sectoral vulnerabilities, and the local governance context—identifies where current measures are insufficient for projected vulnerabilities. This leads to additional measures aimed at strengthening resilience in fisheries, aquaculture, biodiversity, energy, maritime transport, and coastal/maritime tourism, while also improving governance adaptive capacity.

All measures are organised in a structured framework aligned with the SWAP template and coherent with the MSP planning system, to support participatory scenario development and inform future MSP cycles. Each measure is systematically described through a shared set of descriptors and recorded in three databases to ensure comparability and operational use across both processes. Measures are grouped into: (i) climate-resilient areas (e.g., adaptive aquaculture

¹¹ Minallah, N., Khan, W., Zeeshan, M. & Ahmad, T. (2024) <https://doi.org/10.1016/j.simpa.2024.100620>



zones, dynamic/seasonal fisheries restrictions), (ii) nature-based solutions (e.g., seagrass restoration), and (iii) climate-responsive policy and governance tools (e.g., permanent technical tables among potentially conflicting sectors).

Database 1: A first draft of this catalogue, currently composed of approximately 50 measures, is proposed as an entry point for discussion. Throughout the SWAP process, this preliminary list will be critically examined with the community of actors in dedicated workshops and bilateral meetings, who will have the opportunity to validate, modify, integrate, or discard measures based on local knowledge, emerging needs, and sector-specific priorities. Each measure is systematically described by its category, code, and name; function (mitigation or adaptation); climate risk addressed; typology; involved actors; interactions with other uses; implementation status; and expected ecological, socio-economic, or governance impacts. This structure enables thematic comparison, conflict analysis, and planning for coherent intervention pathways. All impact sheets will be compiled into a single PDF document, which will be shared with participants during the workshops to support informed discussion and evaluation.

Database 2: Integration of economic, social and environmental impacts will be carried out for each measure included in database 1. The analysis will be grounded primarily in scientific literature. To ensure clarity and usability during participatory and decision-making processes, impact scales will be defined, with clear metrics and value ranges for each category. For every measure, a dedicated impact sheet will be produced, summarising its expected economic, social and environmental consequences. All impact sheets will be compiled into a single PDF document and shared with participants during the MCA/CBA workshops to support informed discussion and evaluation.

Database 3: A list of costs and benefits will be associated, whenever possible, with each measure based on the literature review. Costs and benefits will be categorised at a minimum into implementation, maintenance, and operational costs, and the analysis will also consider evidence from past damage events and recovery interventions. This is the most challenging dataset to compile, given the absence of official registers that detail coastal investments and reconstruction expenditures. Such limitations may ultimately restrict the number of measures that can be robustly modelled.

Finally, these databases are critical to developing the SWAP. Climate projections will be used to create the scenarios, which will be presented at the scenario workshop. The catalogue of measures will serve as a basis for grounding the scenarios in the logics of intervention and for conducting the participatory MCA and CBA.



1.2.8 Facilitation Resources & Techniques

Organisation, roles and resources

The Sardinia Region (RAS) leads the coordination of the participatory process, with IUAV serving as a methodological and scientific partner. IUAV is responsible for the design of facilitation protocols, the preparation of participatory materials and the coordination of facilitation teams. Each participatory session will require an adequate venue equipped with tables for group work, projection facilities, a reliable internet connection and spaces that allow both plenary exchanges and small-group work. For virtual sessions (e.g., MCA/CBA), IT support will be coordinated by IUAV to ensure smooth access, breakout room management and live synthesis.

SWOT analysis of the participatory process

A SWOT analysis will be conducted at the beginning of Phase II, to identify the strengths, weaknesses, opportunities and threats that may influence the implementation of the Scenario Workshop and the subsequent Adaptation Pathways process. Completing the SWOT before the end of the preparation stage ensures that its findings can directly inform the facilitation plan and the design of participatory activities. The preliminary analysis highlights strengths such as the engagement of motivated local stakeholders, the availability of experienced facilitators, and the opportunity to integrate local knowledge with scientific modelling. Weaknesses and threats include time constraints, uneven levels of technical familiarity among participants, and the potential for sectoral conflicts to emerge during deliberation. By identifying these factors in advance, the facilitation plan is designed to maximise inclusivity, support effective knowledge exchange, and mitigate conflict during group discussions throughout the SWAP process.

Resources allocation

A venue with adequate space for group dynamics, accommodating approximately 20 participants per session, will be allocated for the workshop. Facilitation will rely on IUAV team facilitators, supported by invited experts from relevant sectors. No subcontracting is planned, allowing direct involvement of both facilitators and key stakeholders. IT support will be provided in each venue, including projectors, microphones, reliable Wi-Fi, and initial technical assistance, ensuring that digital tools and presentations run smoothly.

Facilitation tools and methods

Facilitation methods have been carefully structured to align with the objectives of each workshop stage.

- Bilateral events will involve semi-structured interviews and the co-creation of digital cartographies. These cartographies, produced during bilateral meetings, will later be validated in broader stakeholder workshops.
- During Scenario Workshops, participants will engage with locally constructed scenarios



combining narratives, modelling, and climate and socio-economic projections, presented through three or four maps prepared in advance. Group discussions will follow a world café format in three rounds: the first round to identify critiques, the second to discuss advantages, and the third to reach consensus. Each table, consisting of around five participants, will be guided by a facilitator, a note taker, and invited experts from different sectors. The dynamics encourage participants to reflect individually, deliberate in small groups, and then engage in collective discussion, culminating in consensus-based decisions and votes on preferred scenarios.

- The MCA and CBA virtual workshops will adopt the same structured group dynamics. Participants will evaluate measures in small groups, deliberating through the three-round format. At the end of these virtual sessions, participants will vote on their preferred measures and define four to five tipping points, specifying the conditions under which the measures would no longer be valid.
- The Adaptation Pathways workshop will also follow a world café structure with three rounds, guiding participants from individual reflection to group discussion and collective consensus-building.

Table 1: Summary of participation sessions, including period, format and topics. Source: Authors' (2025).

Participation Session	Sessions	Who	When	Format	Integration Issues
Kick-off Meeting	1	SFG	March 2026	Virtual Half day	Introduction to SWAP
Targeted interviews	2	SFG	April-May 2026	Virtual	Mapping of stakeholder perspectives, expectations, and potential conflicts to inform the Scenario Workshop
Scenario Workshop	1	Public	May-June 2026	In-Person Full day	Scenario visions, narratives, participatory cartography
MCA Workshop	1	SFG	July 2026	Virtual Half day	Prioritisation of measures; integration of scenarios into multicriteria
CBA Workshop	1	SFG	July 2026	Half day	Evaluation of economic, social and ecological costs/benefits
Pathways Workshop	1	Public	September-October 2026	In-person Full day	Participatory pathways based on modelling and tipping points
Pathways Validation	1	SFG	September 2026	Virtual Half day	Final validation of pathways for MSP integration



To promote inclusivity, safe spaces, and transparency, clear objectives will be communicated at the start of each session, rules will be established beforehand, and time will be allocated for informal interaction to allow participants to connect. Time management will be strictly observed, potential conflicts anticipated, cultural sensitivity considered, and expectations carefully managed. Support letters from key stakeholders will be sought prior to workshops to strengthen participation and legitimacy.

SWAP Facilitation Support

As part of the INCORE-MED project, Eco-Union will provide technical assistance to the facilitator teams in writing the facilitation plan, which must be completed by February 2026. In particular, Eco-union will support the effective integration of the SWAP process in the facilitation plan. As part of this technical support, Eco-Union will provide:

- Virtual follow-up meetings
- Review of the participatory plan
- Scenario workshop: working meeting about scenarios, non-participant observation in the Scenario workshops, review of materials and final reports
- MCA/CBA workshops: working meeting to plan both sessions; follow-up meeting; review of planning, materials and final report
- Preparation of Pathways workshops: working meeting, review of materials and final reports

1.2.9 Ethics in Data and Participation

The ethical framework guiding the SWAP process in Sardinia follows the principles outlined in the INCORE-MED Project Management Plan (Chapters 5–6). All activities involving the collection, processing, and dissemination of data, including participatory cartographies, workshops, and perception mapping, adhere to the EU General Data Protection Regulation (Reg. 2016/679), applicable regional and national ethical standards, and are agreed within the consortium.

Data Management and Confidentiality

A dedicated Data Management Plan (DMP) ensures secure, traceable collection, storage, and exchange of data from participatory activities. Data are standardised (file naming), stored in secure repositories, and anonymised/encrypted where needed. Consent forms, aligned with the Euro-MED checklist, define the purpose, scope, and duration of use. Each partner manages its own datasets under institutional and national rules, and only anonymised/authorised materials (e.g., transcripts, photos, videos, maps) may be reused for scientific or dissemination purposes. All collected data are systematically organised and analysed to support decision-making: qualitative inputs are coded, cartographies compiled and georeferenced, and quantitative outputs (e.g., votes) summarised. Results are integrated across stakeholder groups to identify themes, consensus, conflicts, and gaps, and to assess scenarios and pathways (including MCA/CBA outputs). Interim findings are shared with participants for validation, and consolidated outputs



inform refined scenarios, adaptation pathways, and final recommendations, communicated through tables, charts, and maps.

Inclusiveness and ethical participation

The participatory design will take care to approach inclusiveness, gender balance, and representation of relevant social and professional groups, with specific attention to youth, local associations, and underrepresented communities. Engagement strategies consider accessibility, linguistic diversity, and the socio-cultural context of coastal and maritime areas.

Safeguarding participants' rights and voices is a core ethical requirement. Facilitators are responsible for creating a safe and respectful environment where all contributions are treated confidentially and equitably. No activity shall involve coercion, discrimination, or exposure to psychological or social risk.

1.3 Phase II – Scenario Workshop

The Phase II - Scenario Workshop focuses on preparing and implementing the Scenario Workshop, a full-day participatory event that enables stakeholders to explore contrasting futures and collectively agree on a scenario to advance toward pathway development. It involves two steps: Developing Future Scenarios for the Workshop and implementing the Scenario Workshop Method.

1.4 Scenario Making: Processes & Techniques

Production of scenarios

In North-eastern Sardinia, the systematic collection of environmental data on climate risk is fundamental to gaining a comprehensive understanding of both current and anticipated impacts on human activities, such as aquaculture and fisheries, as well as on ecosystems, including biodiversity loss. By applying the SWAP methodology, a scenario-building framework will be developed to assess climate-related risks.

These scenarios will be integrated into the modelling analyses within the SWAP framework, enabling consistent comparisons. The participatory process, including participatory cartographies and climate risk perception maps, will foster mutual learning and trust, generating inclusive decision-making spaces where different forms of knowledge shape responses to climate



pressures. Through the SWAP methodology, knowledge will be gathered from fishers, aquaculture operators, and coastal communities on perceived and experienced climate impacts. These outputs will help pinpoint socio-ecological hotspots, priority areas for adaptation, and support evidence-based planning to strengthen climate resilience and sustainable governance in Sardinia's coastal and marine areas.

Workshop Design, facilitation & reporting

Workshops combine individual reflection, small-group deliberation, and plenary consensus-building, with participants selected to represent key sectors and balance expertise, local knowledge, and influence. Sessions are organised in small tables (≈5 people) and facilitated by the IUAV team, supported by note takers and invited experts. Discussion is grounded in shared materials (digital cartographies, infographics, scenario narratives and projections) and inclusive facilitation methods (e.g., world café rounds). A full-day agenda structures the process: scenario presentation, iterative table discussions (critiques, opportunities, convergence), and voting on preferred options, with time for informal exchange.

Outputs are synthesised into draft scenarios and visual/text summaries of preferred measures, then validated through participant feedback to ensure accuracy, transparency, and shared ownership.

1.5 Phase III – Building the Pathways

Phase III - Building the Pathways represents a critical “in-between workshops” stage, where the team leading the process transforms consensus scenarios into tangible, science-grounded, and stakeholder-relevant adaptation pathways. The output is a visual, structured Adaptation Pathways diagram that illustrates different sequences of measures over time under the chosen scenario(s), highlights moments for critical decisions, and outlines conditions that would trigger a shift in strategies.

1.5.1 Selection, Prioritisation & Evaluation

During the Scenario Workshop, three scenarios will be presented to participants through concise narrative descriptions that illustrate plausible future developments under different climate trajectories. Building on these discussions, the workshop will aim to converge on a shared future vision for the Olbia Gulf, providing a collective reference point that stakeholders can use to



evaluate adaptation measures and assess how different management choices perform under contrasting assumptions about climate pressures, sectoral priorities, and governance approaches. Therefore, the workshop's outcome will be a shared future vision that combines elements from different scenarios or clearly chooses one. Stakeholders will indicate their preferences regarding the presented measures to be further scrutinised, measured, and assessed. Then, the **Multi-Criteria Analysis (MCA)** and **Cost-Benefit Analysis (CBA)** workshop will further filter and calibrate preferences and priorities among given measures. The deliberative process will focus on identifying, comparing, and prioritising adaptation measures that operate across sectors and spatial scales. Particular attention will be given to understanding co-existence and trade-offs among sectors of climate change in relation to ecosystem conditions, economic activities, and local livelihoods. Facilitation will be led by IUAV, in close collaboration with RAS, ensuring both methodological rigour and alignment with regional policy objectives. The workshop will combine plenary sessions, small-group discussions, and interactive exercises. Deliberation methods such as dotmocracy, in which participants allocate points to preferred measures, and group scoring, which involves collective ranking according to predefined criteria, will be employed to promote engagement and consensus. The stakeholder group will include representatives from institutional bodies (RAS, municipal authorities, environmental agencies), scientific institutions (IUAV and other research institutions), sectoral actors (fisheries cooperatives, aquaculture consortia, tourism operators), civil society organisations, NGOs, and local communities. Each actor brings a complementary perspective: institutional representatives provide policy and regulatory insight, scientists provide ecological and climatic evidence, sectoral actors offer operational perspectives, and local communities contribute lived experience and knowledge of environmental changes.

The evaluation of adaptation measures during the MCA/CBA workshop will be structured around a shared, transparent set of criteria. The criteria are designed to capture how different measures perform under contrasting priorities and climate trajectories, while supporting an integrated assessment of ecological outcomes, economic implications, and social acceptability. Participants will be invited to assess each measure in relation to its performance within and across scenarios. The evaluation framework ensures that measures are not judged in isolation, but in terms of their contribution to coherent adaptation pathways under realistic future conditions. The core evaluation criteria for adaptation measures include effectiveness, assessing their ability to reduce climate risks and enhance resilience; feasibility, considering practical, technical, and institutional constraints; and the ecosystem-based approach, evaluating impacts on biodiversity, ecosystem functioning, and services across sectors. Cost-benefit analysis examines economic efficiency, weighing costs against potential savings and avoided losses. Social acceptance reflects stakeholder support and perceived fairness, while equity considers the fair distribution of costs and benefits, ensuring inclusive and just adaptation outcomes.

The participatory evaluation process will result in a prioritised list of adaptation measures, each scored against the evaluation criteria. For each measure, a detailed description sheet will be



prepared that outlines objectives, spatial and sectoral scope, implementation steps, estimated costs, and monitoring requirements. The results of the MCA will be integrated with the Cost-Benefit Analysis, which will explicitly compare economic trade-offs among some selected measures and scenarios, supporting a final, evidence-based prioritisation that reflects both stakeholder preferences and economic implications. A comprehensive MCA/CBA report will summarise the workshop discussions, scoring outcomes, and stakeholder feedback, serving as a key resource for evidence-based decision-making and subsequent implementation.

1.5.2 Tipping Points Co-design Workshop

The **Tipping Points Co-Design Workshop** constitutes a critical component of Phase IV, aiming to collaboratively identify thresholds beyond which North-eastern Sardinia's coastal and marine ecosystems, as well as associated human activities, may experience irreversible or highly disruptive impacts. The science-based pathways developed in the previous phase serve as a starting point for discussions, allowing participants to ground deliberations in quantitative evidence while incorporating local knowledge and experiential insights. The workshop will be carefully facilitated to create inclusive, safe spaces for participation, ensuring that all stakeholders can contribute freely. Diverse group structures will be employed, bringing together sectoral experts, institutional representatives, scientists, and local community members to foster cross-disciplinary dialogue and mutual learning. This approach encourages the identification of locally relevant vulnerabilities and adaptive strategies that may not emerge through quantitative analyses alone. Facilitation activities will centre on map-based pathway exercises, in which participants interactively explore the spatial distributions of climate risks, adaptation measures, and potential socio-ecological outcomes. Through iterative discussions, stakeholders will evaluate and validate climate and ecological thresholds. Consensus-building techniques, such as World Cafés, will be applied to ensure transparent documentation of agreed tipping points and areas of uncertainty. Once agreed upon, these validated thresholds will be refined and finalised by the scientific team, ensuring consistency, clarity, and integration with the broader modelling and scenario analyses.

The validated tipping points will directly inform the subsequent Multi-Criteria Analysis (MCA) and Cost-Benefit Analysis (CBA) by providing clear thresholds that define when ecological, economic, or social systems may experience critical stress. These thresholds will be used to assess the potential effectiveness, feasibility, and cost-benefit performance of adaptation measures under different scenarios, ensuring that the prioritisation of actions explicitly accounts for the limits of system resilience. By linking scientifically grounded tipping points with stakeholder-informed perspectives, the MCA/CBA process will enable evidence-based decision-making, helping to identify adaptation pathways that maximise benefits, minimise risks, and enhance long-term socio-ecological sustainability in North-eastern Sardinia.



1.5.3 Modelling Techniques & Process

The scenario outputs will be developed by integrating available ecological and socio-environmental knowledge to explore plausible future changes under climate pressures over different time horizons. The analysis considers key environmental drivers and their potential effects on marine ecosystems and human activities. The assessment focuses on major coastal and marine sectors, examining how these systems may be affected under different future conditions. The scenario development combines quantitative outputs with qualitative insights from stakeholders, gathered through participatory mapping, interviews, and local knowledge sessions. Climate risk maps previously produced within the SWAP framework will support these discussions, serving as visual tools to facilitate dialogue and help identify adaptive responses that may not emerge from modelling alone.

A **Multi-Criteria Analysis (MCA)** will integrate pre-scenario outputs with stakeholder perspectives, assigning relative weights to sectors based on the scenario and its associated climate trajectory. The modelling and MCA results will inform a Cost-Benefit Analysis (CBA) to assess the economic viability of each selected measure.

1.5.4 Feedback to Participants

Preliminary adaptation pathway diagrams will be shared with the core stakeholder group through a structured communication process. Stakeholders will receive visual summaries and concise explanations of the proposed pathways, enabling them to review the workshop outcomes. Feedback will be collected through flexible, interactive formats, such as small-group online meetings, allowing participants to provide comments, clarify interpretations, and suggest refinements. This approach ensures that the pathways reflect stakeholders' perspectives accurately and fosters continued engagement and co-ownership of the results.

1.6 Phase IV – Adaptation Pathways Workshop

The Phase IV – Adaptation Pathways focuses on the formalisation and assessment of the proposed pathways through integrated ecological, economic, and social modelling. Model outputs are iteratively shared with stakeholders and refined based on feedback, ensuring that pathways are scientifically robust, feasible, and grounded in local knowledge and priorities.



7.6.7 Modelling the Pathways

Following the co-design process, adaptation pathways will be further analysed and refined through an integrated assessment of environmental, economic, and social dimensions. This step supports the evaluation of how different management options may influence coastal and marine systems under changing climate conditions. The analysis considers key ecosystem components and main socio-economic sectors, exploring their potential responses to alternative adaptation choices and environmental pressures. The results provide a basis for comparing pathways and supporting informed decision-making within the planning process. Economic models, primarily based on Cost-Benefit Analysis (CBA), will evaluate the financial implications of each pathway, including implementation costs, avoided losses, and potential returns. This allows comparison of economic trade-offs across measures and scenarios, integrating the economic dimension into decision-making. Social models will complement ecological and economic analyses by evaluating the social acceptability, institutional feasibility, and potential behavioural responses of stakeholders and local communities to the proposed measures. This dimension is essential to ensure that they are also socially practicable, legitimate, and grounded in local knowledge, preferences, and capacities.

Within the SWAP process, stakeholder capacities, perceptions, and willingness to engage will be systematically assessed. These inputs will allow the project to capture variations in understanding, readiness, and constraints across sectors and actor groups.

Validation of the pathways will occur iteratively. Initial projections from ecological and economic models will be shared with stakeholders through visual outputs, scenario narratives, and participatory exercises. Feedback will be incorporated to refine assumptions, calibrate social responses, and adjust measures, ensuring that the pathways reflect both scientific evidence and local experience. The modelling process will be fully transparent and reproducible. All assumptions, input data, scenario parameters, and methodological choices will be documented and communicated to stakeholders. This transparency facilitates credibility, trust, and iterative refinement, enabling participants to understand the rationale behind the outputs and to propose adjustments where needed.

The outputs of this process will include visual representations of each pathway, showing predicted ecological, economic, and social outcomes, potential risks, and areas of uncertainty.



1.7 Phase V – Validation, Integration & Dissemination

The Phase V – Validation, Integration & Dissemination is the final stage of the process, where results are consolidated and validated. Adaptation pathways are aligned with planning frameworks, including Marine Spatial Planning (MSP), and stakeholder inputs are integrated into final outputs. The phase also focuses on disseminating results to support knowledge transfer and policy uptake.

1.7.1 Final modelling and integration of results

The final modelling and integration of results will synthesise all previously generated outputs, combining ecological, economic, and social analyses into a single coherent framework. Ecological modelling will support the assessment of potential changes in key coastal and marine systems under different adaptation options, while economic models will quantify the costs, benefits, and trade-offs of different adaptation measures through Cost-Benefit Analysis. Social considerations, including stakeholder preferences and feasibility assessments, will be incorporated to ensure that pathways are locally relevant and actionable.

This integrated approach will enable the identification of coherent adaptation pathways, highlight synergies and trade-offs across sectors, and provide a robust evidence base for decision-making. Outputs will be compiled into a structured geospatial and analytical framework that links adaptation measures to sectoral and climate outcomes. This framework will be compatible with MSP and ICZM planning instruments, facilitating its practical application by regional and municipal authorities. The final deliverables will include prioritised adaptation pathways, scenario maps, quantitative and qualitative assessments, and methodological documentation to ensure transparency, reproducibility, and operational usability.

1.7.2 Final Validation with Stakeholders and Municipal Authorities

The final validation phase will bring together all stakeholders (likely online), including representatives from municipal authorities, technical agencies, research partners, and local community groups. This session will serve as a collective reflection moment, aimed at validating the proposed adaptation scenarios and their spatial representation. Participants will have had the time to review the participatory maps, discuss priorities, and confirm the alignment between local



needs and strategic objectives. The workshop will adopt a structured facilitation method, combining plenary discussions with breakout rooms, attempting to ensure that all sectors are adequately represented.

1.7.3 Public Dissemination Event

Following the validation workshop, a public dissemination event will be organised to share the co-designed adaptation scenarios and participatory maps with a wider audience. The event will take the form of an open exhibition combined with short presentations from the project team, municipal representatives, and citizen groups involved in the process. Key materials will include large-scale printed maps, thematic posters, and interactive digital maps displaying the proposed adaptation pathways. The exhibition will be hosted in a public venue (e.g., municipal hall or cultural centre) to encourage broad participation and dialogue with citizens, schools, and local associations. Local media (e.g. Videolina) will be key to ensuring coverage of the event.

1.7.4 Media Strategy

The communication and media strategy will operate across three complementary levels:

- Local outreach, via press releases, local and regional newspapers, broadcasters (Videolina) and social media, and municipal newsletters highlighting the process and its results.
- Community engagement, using social media campaigns, short video interviews, and visual storytelling to make the adaptation maps and pathways accessible to non-specialist audiences.
- Coordinated editorial plan in line with the INCORE-MED communication plan will ensure coherence across all communication channels and promote visibility at both local and Mediterranean scales.
- Scientific dissemination, through conference presentations and academic papers.

1.7.5 Climate Adaptation Strategy and Co-Design Document

The Climate Adaptation Strategy will synthesise the outcomes of the participatory process into a structured and actionable framework. The document will include:

- An overview of local vulnerabilities and climate risks;
- A synthesis of participatory mapping outcomes;
- A set of adaptation pathways, describing short-, medium-, and long-term actions;
- Governance and monitoring mechanisms to ensure implementation.
- Community engagement and ocean citizenship suggestions to enhance stewardship.

The co-design process will be documented in a digital document, a storymap created during the activities. This document will follow the methodological structure of the INCCAS book, detailing



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the phases of stakeholder engagement, data integration, scenario building, and validation. It will serve both as a record of the participatory process and as a transferable methodological reference for future applications in other coastal and urban contexts. This material will provide evidence-based recommendations to inform the ongoing revision of the Italian Maritime Spatial Plan (MSP) and support regional decision-making. Public consultation processes, in which draft MSP proposals are shared, will provide an additional opportunity for stakeholders and local authorities to reflect on the knowledge and priorities gathered through the SWAP process.

2 THE PILOT AREA: COASTAL PROTECTION & MANAGEMENT PLAN, CATALONIA





2.1 Introduction to the Catalonia pilot

The Interreg Euro-Med INCORE-MED project constitutes a testing intervention. Test projects are generally conceived by the Interreg Euro-Med programme as experimental sites of common methods and tools. Conversely, the Catalan case is a real-life test with different implications for ensuring methodological robustness during the translation process. For instance, the regional scale and the planning instrument influence the scope of the participatory process and the final design of adaptation pathways.

The SWAP protocol is a methodological procedure for co-designing adaptation pathways to address coastal erosion processes within the context of the **Catalan Coastal Protection and Management Plan** (hereafter, **PPOL**)¹². The PPOL is coordinated by the Directorate of Coastal Policies of the government of Catalonia (DGCP)¹³ acting as an associated partner of INCORE-MED. The adaptation pathway, as a planning concept, will also be a product of the PPOL framework, as required by the Catalan coastal protection law¹⁴. It is an innovative provision for the Catalan urban master plans¹⁵ and a critical requirement to be adapted to the legal procedures established in Catalonia's urban planning law¹⁶. Initially, the adaptation pathway, as a planning method, was conceptually integrated into the PPOL, with scientific support from the International Centre for Coastal Resources Research (CIIRC) of the Universitat Politècnica de Catalunya (UPC). In 2022, the associated centre, *Laboratori d'Enginyeria Marítima* (UPC)¹⁷, developed an initial conceptual framework of adaptation pathways. In the context of INCORE-MED, the planning method "Scenario Workshop on Adaptation Pathways (SWAP)" is being transferred through training and mentoring, along with the planning and implementation from June 2025 to October 2026.

Accordingly, **the objective of the Catalan pilot case** is to develop adaptation pathways to climate risks for the coastal archetypes¹⁸ of the Catalan coast, relating and prioritising them for each coastal management area¹⁹. The process must identify all possible adaptation pathways rather than a single solution, thereby facilitating discussion and territorial consensus on adaptation.

¹² PPOL is the Catalan abbreviation for Pla de Protecció i Ordenació del Litoral.

¹³ DGCP is the abbreviation of Direcció General de Polítiques del Litoral.

¹⁴ Llei 8/2010, del 25 de juliol, de protecció i ordenació del litoral.

¹⁵ What is an urban master plan? (Plan Director Urbanístic)

[https://territori.gencat.cat/ca/06_territori_i_urbanisme/planejament_urbanistic/pla_director_urbanistic_pdu/que_es/index.html#googtrans\(ca|en\)](https://territori.gencat.cat/ca/06_territori_i_urbanisme/planejament_urbanistic/pla_director_urbanistic_pdu/que_es/index.html#googtrans(ca|en))

¹⁶ Legislative Decree 1/2010, of August 3.

¹⁷ <https://lim.upc.edu/ca>

¹⁸ A spatial planning technique to extrapolate coastal reality into a set of archetypes characterised by land-use patterns, their ecosystems, their socioeconomic structure and their coastal morpho dynamics. This approach has been scientifically applied for coastal erosion: <https://doi.org/10.1088/2515-7620/ab1871>; <https://doi.org/10.1016/j.envsci.2020.05.003>

¹⁹ The planning units are territorial functional areas (Àmbits Territorials Funcionals – ATF), as defined in Article 2 of the [Law](#)

The SWAP combines the Scenario Workshop method, emphasising participatory scenario co-creation with stakeholders, and the Adaptation Pathways approach, which helps structure decisions over time by identifying possible cost-effective adaptation actions, critical tipping points, and building long-term pathways. The additional methodological insights from the SWAP are expected to enhance the transparent integration of institutional interests, scientific knowledge, and stakeholders' opinions. It also reinforces the co-design approach by securing stakeholders' consent to legitimise the process and its outcomes, while also triggering co-learning about coastal erosion and adaptation pathways.

The process will deliver the book titled "Catalan Coastal Adaptation Pathways (CC3AP)." This product corresponds with the delivery 3.2.1. of the INCORE-MED project and one of the PPOL's planning products. The conjunction of an integrated knowledge base, communication materials (Story map, video, booklet), methodological guidelines, the learned capacities for participatory planning among the Catalan Government and the stakeholders participating in the process, including facilitators, modellers, and other analysts who comprise the SWAP team, will enhance flexible adaptation to uncertainty, complexity, and ambiguity in the long term, while facilitating future adaptation and replication processes at regional and local scales.

Catalonia's Institutional Framework facing coastal climate risks

The Catalan coast faces significant structural pressures that threaten both its capacity for natural regeneration and its socio-economic functions. Climate projections predict higher temperatures, faster beach and delta erosion, aquifer salinisation, and greater infrastructure vulnerability. Additionally, projections show an increased risk of coastal flooding, with the Ebro Delta being particularly vulnerable. The coastline spans 692 km and is highly diverse: 56% consists of cliffs or low-lying shores, 22% consists of urban beaches, 17% consists of natural beaches, and the remaining 5% consists of ports and other maritime structures. The region has over 40 protected natural areas (PEIN and Natura 2000 Network), covering around 18,000 hectares of valuable ecosystems like Posidonia meadows, dunes, and wetlands. Although the coast represents only 7% of Catalonia's total land area, it is home to over 42% of the region's population, with an average of more than 10,000 inhabitants per kilometre of coastline across 70 coastal municipalities. Economic activity is heavily concentrated in the Barcelona metropolitan area and along the coast, particularly in the industrial, logistics, port, and tourism sectors. Tourism is primarily focused on Barcelona, the Costa Brava, and the Costa Daurada, which together account for over 70% of hotel stays and nearly 80% of international visitors. The coastal area is governed by various plans and strategies at different levels (state, regional, and local). As a result, an accumulation of regulations has emerged, each with its own objectives. While many of these objectives are complementary, the sectoral nature of these regulations often leads to incoherent management practices. Despite these efforts, fully integrated coastal planning remains elusive. The Barcelona Convention, which established a binding protocol for Integrated Coastal Zone Management, mandates this approach, but its effective implementation remains pending. This intense pressure, coupled with the impacts



of climate change and fragmented management, makes the Catalan coast one of the most vulnerable areas in the region.

In recent years, the principles of **Integrated Coastal Zone Management** (ICZM) have served as the foundation for new regulatory initiatives by the Government of Catalonia. Key among these is the 8/2020 Law on Coastal Protection and Planning²⁰, the Maritime Strategy of Catalonia 2030²¹, and the updated generation of Partial Territorial Plans (PTT)²². These instruments underscore the need for a unified approach to managing land-sea interactions and to overcoming the historical fragmentation in coastal management. Moreover, the diverse nature of the Catalan coast requires territorial planning models that account for different coastline types and the varying intensity of environmental and socio-economic dynamics across the region.

The climate emergency declared by the Government of Catalonia on 14 May 2019 requires public policies to prioritise options with the least climate impact and the most significant contribution to adaptation to the conditions resulting from climate change, as well as to adopt the necessary measures to halt the worrying loss of biodiversity and promote the recovery of ecosystems. The Government of Catalonia has adopted a series of measures to combat climate change and promote sustainable development, including the **Catalan Strategy for Adapting to Climate Change 2021-2030** (ESCACC30), under which the coastal adaptation plan was among the measures agreed upon by participants²³.

The Coastal Protection and Management Plan (PPOL) seeks to integrate these frameworks and align them with broader territorial, maritime, and sectoral policies, coordinating land-based and maritime planning. It also aims to foster coordination with other strategic plans and municipal urban planning to ensure coherence in coastal management and protection. Finally, strengthening existing participatory governance is vital to promoting collaboration among public administrations, economic and social stakeholders, and the public, ensuring their involvement in decision-making.

2.2 Phase I: Preparation

Phase I - Preparation establishes the technical, social, and institutional foundations for an effective, inclusive, evidence-based, and actionable participatory process. It includes the structuring of governance, the creation and preparation of working teams, stakeholder mapping and engagement, the development and structure of a knowledge base, and a facilitation plan.

²⁰ Ley 8/2020, de 30 de julio, de protección y ordenación del litoral

²¹ 2030 Maritime Strategy of Catalonia

²² Plans Parcials Territorials

²³ <https://canviclimatic.gencat.cat/ca/ambits/adaptacio/estrategia-catalana-dadaptacio-al-canvi-climatic-2021-2030/>

2.2.1 Governance, Roles, and Team Building

Roles and responsibilities

Government of Catalunya: D.G. for Coastal Policies (DGCP): It oversees the process and coordinates the Coastal Protection and Management Plan (PPOL). Three team members are assigned to the SWAP process, and others participate indirectly. The full process is led by the coordinator of Catalonia's Coastal Protection and Management Plan.

International Centre for Coastal Resources Research (CIIRC): a public consortium comprising the Polytechnic University of Catalonia (UPC) and the Government of Catalonia. They oversee the scientific design of the PPOL's coastal adaptation pathways. Additionally, the CIIRC brings knowledge and resources from two coastal adaptation projects: ECCO_TS²⁴ and COAST-SCAPES²⁵.

Eco-union (E-U) is responsible for transferring the SWAP methodology and supporting the DGCP throughout the adoption process within PPOL planning. Eco-union provides guidelines, resources from past projects and advice during the process. This collaboration involves providing additional support during the preparation and implementation stages and collecting information throughout the process of writing the Catalan Coastal Adaptation Pathways book and developing communication materials, such as a story map.

The DGCP has integrated five technical assistance services to support the development of the PPOL in 2025 and 2026. Some of these are directly connected to the elaboration of the Adaptation Pathways.

Facilitation company (FC): the Gabinete CERES will develop a facilitation plan for the PPOL and lead the communication, participatory designs, facilitation, and reporting.

Socio-economic consultancy (SEC): the Gabinet Estudis Econòmics, S.L. will deliver the socioeconomic impact assessment of the Coastal Protection and Management Plan (PPOL), including socio-economic scenarios and cost-benefit analysis of coastal adaptation options.

Coordination mechanisms

The SWAP development requires high-level, cross-cutting collaboration among all teams involved in the PPOL to effectively align political interests with techno-scientific knowledge and participatory design. As a general matter, the PPOL coordination team schedules external meetings with subcontractors and partners to address specific tasks set out in the respective terms of reference for each agreement and contractual relationship related to the PPOL technical assistance. There are two mechanisms for information exchange. The bilateral meetings between the DGCP and each external team follow specific processes for external subcontracting. Bilateral meetings with eco-union and other INCORE-MED partners serve to track the process of adapting

²⁴ Enhanced Coastal Climate Observatory for Transformation and Sustainability (2024-2027). Access point: <https://ecco-ts.upc.edu/>

²⁵ Rethinking COASTal landSCAPES with climate-resilient interventions: systemic land-to-sea solutions (2025-2029). Access point: <https://cordis.europa.eu/project/id/101213138>



the SWAP method to the PPOL planning context, to exchange SWAP logic and PPOL planning requirements, and to collect ongoing information about the adoption of the PPOL. The intergroup meetings are to exchange information and expectations throughout the process, translate requirements into a participatory process and modelling exercises. Sharing documentation from each party helps understand and align diverse perspectives. During the SWAP implementation, the frequency and typology of meetings (informative, working, decision-making), as well as advisory requirements, are planned flexibly on an ongoing basis to better fit the needs of specific processes and outputs, as well as teams' availability. The frequency of intergroup meetings is critical to implementing SWAP and to ensuring all parties are on the same page throughout the co-design process for adaptation pathways. This is especially important for preparing workshops and translating participatory inputs into modelling exercises. An initial proposal is launched from INCORE-MEDs mentors (Table 1).

2.2.2 Work Plan & Monitoring

The SWAP methodology is structured in clear, sequential phases, while maintaining flexibility to accommodate emerging data, evolving stakeholder perspectives and issues/risks in the PPOL planning context. The process is inherently iterative, allowing the Catalan government and stakeholders to revisit, review, and refine each phase as new information and feedback arise. The SWAP method is structured around six phases, with some overlap due to the time constraints of the PPOL participatory process, which must take place during the first semester of 2026. The process began in June 2025 and is scheduled for finalisation by October 2026. The following provides a brief explanation of each phase, including milestones and deliverables.

Phase 0: Initiation Stage

In the context of the INCORE-MED project, the SWAP process in Catalonia began in June 2025 with initial meetings between the eco-union and the DGCP to align perspectives and define the objectives and expectations of the PPOL framework. In July, a two-day training took place in Barcelona. The PPOL's coordination team joined the training, as did a representative of the CIIRC research centre, a representative from public participation, and a technician from the DGCP. Previously, the participants received the SWAP guidelines prepared in the context of INCORE-MED. The training introduces the method to participants during the first day. On the second day, a more interactive session reviews the state of knowledge, analytical capacities, stakeholder engagement, political expectations, and planning timelines. All these elements help the team accommodate the SWAP method into the official schedule and align technical and scientific resources. A first Gantt Chart was delivered to guide the planning document (D.1.1.1) and to initiate the preparation phase.

The phase leads to a political commitment to implement SWAP within the PPOL's participatory process, with support from INCORE-MED. Based on this SWAP logic, the DGCP adapts the terms of

reference guiding the agreement with the CIIRC research centre to support the development of coastal adaptation pathways.

In the PPOL planning context, the DGCP has created the conditions to prepare SWAP and align it with stakeholders' expectations. Particularly relevant is:

- Institutional capacities. The coastal climate adaptation strategy is a legal requirement. An internal team of technicians with diverse expertise ensures institutional leadership and the integration of the SWAP method. The signature of an agreement with the CIIRC to scientifically support the elaboration of the coastal adaptation pathways. Secondly, a public tender to subcontract technical assistance for 5 service contract lots²⁶.
- Stakeholder consultation in 2022. 81 participants joined the consultation activities from different stakeholder groups (40 government officials, 23 academics, 20 CSO representatives and 7 economic sector representatives).²⁷ In addition, interviews with experts were also conducted. These forms of direct data collection from the territory enabled the identification of stakeholders' expectations, coastal intervention logics, and sources of information.

Phase I: Preparation Stage

SWAP preparation begins in July 2025 and continues through February 2026. Some activities require additional time to be delivered and have been extended to overlap with the next phases. For instance, the catalogue of measures was postponed to advance the preparation of planning requirements, such as the Document of Objectives and Proposals and the coastal archetypes. The objective of the preparation phase is to plan for the implementation of SWAP through a participatory process. This includes developing planning documents to guide the process; establishing teams and coordinating; subcontracting for external expertise; organising a knowledge base; developing planning methods and tools, such as a coastal adaptation measure database, scenario modelling, and coastal archetypes; and engaging institutional stakeholders. The Document of Objectives and Proposal of the PPOL is the key planning output that integrates political priorities, challenges, scenarios, and interventions, setting the political basis for the participatory process of the SWAP. Finally, a period of institutional consultations will take place in January and February 2026 to disseminate the PPOL's document and encourage institutional engagement.

Key Deliveries	- SWAP Planning document (INCORE-MED D.1.1.1.) - PPOL Objectives and Propositions document. - PPOL Facilitation Plan
Key Processes	- Institutional stakeholder engagement - Initiation of the participatory process

²⁶ Access to the public tender: <https://contractaciopublica.cat/ca/detall-publicacio/300635703>

²⁷ <https://participa.gencat.cat/processes/ppol>



Phase II: Scenario Workshop²⁸

The next phase initiates the participatory process with stakeholders. It focuses on preparing and implementing the Scenario Workshop based on the data collected during the preparation and integrated in the Document of Objectives and Proposal. The coastal scenarios proposed in this document will be adapted into coastal archetypes. This activity is developed in close cooperation with the external parties, the CIIRC²⁹. The facilitation company (FC) will prepare different materials and design two types of scenario workshops oriented for each coastal planning unit (5) and to sectoral areas included in the PPOL (governance, economy, mobility). The scenarios will establish the baseline vision for prioritising and evaluating measures and define tipping points along adaptation pathways in coherence with the coastal archetypes and adjusted by coastal planning units.

Key Deliveries	- Baseline scenarios oriented to the Catalan coastal archetypes.
Key Processes	- Collective visions about coastal scenarios

Phase III: Building Coastal Adaptation Pathways

The next phase is a critical stage in which the coordination team leading the process transforms the visions, discussions, and consensus scenarios from the scenario workshops into tangible, science-grounded, and stakeholder-relevant adaptation pathways. This activity is developed in close cooperation with the external parties, the CIIRC, the socio-economic consultancy, and the facilitation company. eco-union will follow the process and provide advisory support upon request. Building on the Document of Objectives and Proposals and the Scenario Workshops, the team systematically analyses possible logics of interventions and adaptation measures, exploring their feasibility and effectiveness over time under different climate and socio-economic futures. This process is supported by public workshops and stakeholder mapping with experts³⁰. There will be two types of workshops with different modalities (virtual, in-person, self-organised). The Territorial Prioritisation Workshops will focus on prioritising coastal interventions, while the other type will focus on Cost-Benefit Analysis (CBA) for the selected measures. The use of the database catalogue (#1 Measures, #2 Impacts, #3 Costs) is essential to clearly inform stakeholders before each workshop about the options identified and evaluated internally. Based on participatory insights, the CIIRC will model in greater detail using advanced tools and coastal erosion/SLR impact models. This process assesses the performance of interventions under different shared socioeconomic pathways (SSPs) and simulates the behaviour and tipping points of various

²⁸ It corresponds to "Phase I: Presentation and Reference Framework" of the PPOL's facilitation plan.

²⁹ This phase corresponds with the activity 2.2 (MCA & CBA of the possible solutions for achieving future scenarios) included in the collaboration agreement mentioned above.

³⁰ This corresponds with the "Phase 3 – Prioritisation of actions and models" of the PPOL's facilitation plan.

strategies, either alone or in combination. The socio-economic consultancy will support this process.

Key Deliveries	- Catalogue of interventions - Initial tipping points and adaptation pathways
Key Processes	- Shared prioritisation and evaluation of coastal interventions

Phase IV: Adaptation Pathways Workshops³¹

The definition of adaptation pathways from the previous phase is further discussed with stakeholders and participants, who collectively translate scenarios and strategies into a tangible, time-based roadmap for action, defining when and how interventions should be implemented as conditions evolve, while considering archetypes and coastal planning units. This process will be delivered through various workshop modalities (virtual, in-person, self-organised), with selected stakeholders and open participation across the five coastal planning units. Organising workshops at several moments will facilitate the CIIRC's calibration tasks in two steps: first, based on feedback from administrations and experts, and second, through territorial workshops with open participation.

Key Deliveries	- Catalogue of interventions - Initial tipping points and adaptation pathways
Key Processes	- Shared prioritisation and evaluation of coastal interventions

Phase V: Integration, Validation and Dissemination³²

The last phase includes three kinds of processes to finalise and integrate the adaptation pathways in the PPOL. Firstly, the DGCP, in collaboration with the CIIRC and the socio-economic consultancy, integrates the outputs from Pathways Workshops into a consolidated, scientifically grounded, and collectively owned adaptation pathways plan. This integration involves calibrating the modelling using participatory inputs. The diverse inputs will help to produce adaptation pathways that reflect the territory's collective aspirations, concerns, and priorities. The final pathways draft, along with the underlying assumptions and results of the modelling exercises, will be circulated to all stakeholders, accompanied by clear and accessible explanatory notes, to facilitate understanding via the virtual platform and the territorial workshops across the five coastal planning units. The final set of feedback is integrated to produce the final version of the pathways, which is

³¹ This corresponds with the "Phase 3 – Prioritisation of actions and models" of the PPOL's facilitation plan.

³² It corresponds with Phase 3 of the ToR of the agreement with the CIIRC research centre. It also corresponds with the "Phase 5: Validation, return and integration into the PPOL" of the PPOL's facilitation plan.



communicated through official channels and a virtual event. The final step is to finalise the Adaptation Pathways book and to publish it in October 2026.

Key Deliveries	- Catalan Coastal Adaptation Pathways Book (CC3P).
Key Processes	Legitimisation of the coastal adaptation pathways and acquire institutional capacities.

2.2.3 Stakeholder Engagement

The SWAP is integrated within the PPOL's official participatory process. There are various engagement methods and moments to ensure compliance with legal requirements for information and public participation. Accordingly, the DGCP will mobilise additional forms of direct consultation with coastal municipalities, regional departments, and other institutions with direct coastal competencies. This will help collect opinions and expectations regarding the advanced planning document, the Document of Objectives and Proposals. A stakeholder mapping was elaborated based on the 2022 stakeholders' consultation organised by the Directorate of Coastal Policies (DGCP), which serves as a baseline for refining stakeholder mapping and the engagement protocol. Additionally, a list of stakeholders was identified through a review of past participatory processes related to coastal management and the Catalan climate strategy. This database will help increase stakeholders' reach.

Official public participation

The official public participation is structured and developed in accordance with the reference framework plan delivered by the facilitation company (FC). The facilitation plan, including a communication strategy, was delivered by December 2025. The public call will be announced in February 2026 and will comprise in-person and virtual workshops along the five coastal planning units, along with a virtual survey to collect additional insights. Public participation will be published on the Catalan government's participation website, and public announcements will be made through other communication channels to reach all coastal areas and municipalities.

Steering Group & Working Groups

The DGCP has designated a steering group comprising governmental institutions, public scientific centres and an INCORE-MED partner. In the context of SWAP implementation, this steering group will be engaged at key moments and as needed by the coordination team. Governmental institutions will also be engaged in the consultation process before the official start of the participatory process. Representatives from this group will be invited to join specific expert sessions to evaluate measures and design coastal pathways. However, according to the participatory plan delivered by the FC, the steering group will primarily follow up on: i) Validate the quality and neutrality of the process; ii) Recognise the key organisations and involve them as

collaborators in the process; iii) Assist in driving the process in a broad sense (publicity, inviting additional stakeholders, etc.). Additionally, these functions also consider the influence of the political issue underpinning the PPOL planning process and its expected impact. The steering group must be an executive and operational body, not a political space. It must facilitate the deployment of the participatory process beyond the positions of the individuals or institutions it represents. The steering group comprises approximately 15 representatives from the public administration (Catalan, subregional, and State), academics, a representative from the INCORE-MED project and another from the facilitation company.

Table 2: List of organisations of the Steering Group

Steering group	
Directorate-General	Department of Territory, Housing and Ecological Transition: Technical Cabinet and Citizen Participation
Coordination unit	General Directorate of Coastal Policies (DGCP)
Facilitation company	Gabinet Ceres
Stakeholders	Directorate-General for Territorial Planning, Urbanism and Architecture Directorate-General Marine Policy & Sustainable Fisheries Directorate-General for Environmental Policies and Nature Directorate-General for Transport and Mobility (SdPorts) Catalonia's Cartographic and Geological Institute (ICGC) General Administration of the State (Directorate-General Coast) Most representative municipalist associations (FCM/ACM) Barcelona Metropolitan Area Barcelona City Council CIIRC Bluenet.cat INCORE-MED

Additionally, a group of stakeholders could be called upon to help develop coastal pathways. These experts serve as additional technical stakeholders, expanding the steering committee to existing institutional working groups where the DGCP currently participate. The reason for not including a more diverse, larger group of stakeholders is to keep the process manageable, since there will be many sessions and ways to participate in a relatively small period.



2.2.4 Knowledge Base

The knowledge base is an essential resource informing the SWAP process. The adaptation pathways are designed based on the best available knowledge about coastal evolution/ retreat dynamics and processes in Catalonia. The knowledge base consists of a database developed through the SWAP process and, in the final stage, delivered as an open-access resource. However, it serves as a baseline for developing the catalogue of measures, the multicriteria and cost-benefit analyses of selected measures, and the modelling of tipping points. Furthermore, due to the planning scale at the supra-municipal level, the knowledge base needs to adopt an integrated perspective on coastal erosion dynamics and processes, including hydrology, geomorphology, oceanography, climatology, ecology, environmental sciences, geoengineering, and their intersections with social sciences related to evaluation criteria, as well as social and cultural perspectives on climate adaptation and coastal landscape change.

The knowledge base is compounded by:

- Bibliographic database of scientific and grey literature (Excel format; Zotero). This database was developed through various methods. A consultation survey to stakeholders (no. 52; year, 2022), and additional literature incorporated by the CIIRC research centre supporting the coastal modelling and by the socio-economic consultancy regarding cost-benefit analysis. A final bibliographic database will be delivered at the end of the process.
- Quantitative climate risk data collection: the CIIRC and the DGCP describe the availability of databases (impacts, costs), gaps, access, and plans to produce socio-economic and climate risk models across temporal scales (erosion, flooding). This includes previous and ad hoc studies, cartographies, and diverse open-access databases on climate, socioeconomics, and land use that inform the development of key deliverables during the preparation and subsequent stages. This list will be compiled along the SWAP process.
- Climate narrative: a climate and coastal narrative report is produced based on the previous PPOL consultation (2022) with stakeholders and additional bibliography.

Part of this information feeds into the PPOL's advance document, titled the **Document of Objectives and Proposals (DOP)**, to be delivered by December 2026. This document will include the objectives, scenarios, and coastal intervention.

Due to time constraints, some of these activities, such as the narrative analysis, were not further expanded through additional data collection and analysis. It is also essential to consider knowledge gaps, how they limit the SWAP process, how the process could be approached thereafter, and to make these concerns available to stakeholders.

2.2.5 Climate Risks & Catalogue of Measures

The knowledge base supports the development of the catalogue of measures and the production of climate and coastal scenarios.

Climate and coastal narratives

The climate and coastal narratives are based on the 2022 PPOL consultation process and a review of reports and current policies. The DGCP produced an internal narrative analysis that follows a coding system connected with the key planning dimensions of the PPOL (adaptation, green infrastructure and governance). A secondary production based on these narratives guides the elaboration of baseline scenarios for SSP2-4.5 and SSP5-8.5, as well as the PPOL's ideal scenarios.

Climate Risks Projections

The definition of climate change scenarios for the Catalan coast in the PPOL planning context must be consistent with the future high-resolution cartography of coastal flooding and erosion in Catalonia. Selected scenarios are based on the latest IPCC Assessment Report (AR6) and the available regionalisation data for Catalonia, taken from the PRME regional marine projections (IH-Cantabria), and focusing on the following coastal change factors: mean sea level, wave conditions, storm surge, and tides. The evolution of this key coastal driver is assessed under two scenarios, SSP2-4.5 and SSP5-8.5, for the period 2025-2100. An archetype-based framing enables consistent, coast-wide comparisons of how different typologies are expected to evolve under current trends and provides a quantitative reference for evaluating alternative adaptation paths and interventions. However, the future of the Catalan coast not only depends on climate (external) variables, but on local socioeconomic and ecological trends, as well as on public and private plans and actions. There is a group of public initiatives –such as the Catalan Nature and Biodiversity Strategy or the Master Plans to review unsustainable land use on the coast, among many others– whose success will influence the future climate vulnerability and adaptive capacity of the Catalan coast. Therefore, to build a narrative for the future of the Catalan coast, the SSP2 and SSP5 global socioeconomic development itineraries are regionalised according to the level of completion of current and planned public and private initiatives for the coast's sustainability.

Catalogue of Measures

The catalogue of measures will be based on the PPOL requirements regarding intervention scales. The definition of interventions will be general formulations to be applied to specific coastal archetypes. The Initial planning document (DOP) establishes the three structural dispositions (adaptation, green infrastructure, governance) and provides a framework for the cataloguing.



Table 3: Catalogue of Adaptation Measures to Coastal Erosion

	Strategy	Objective	Measure
Grey Solutions	Protection	Fixing the shoreline	Seawall
			Sheet piles
			Revetment
		Modulate the shoreline	Groin
			Detached breakwater
			Nourishment
			Dunes
NBS	Hybrid - Combination	Wetland restoration	
		Seagrass meadows	
	Retreat	Shoreline dynamics acceptance	Managed realignment
	Accommodation		

According to the SWAP methodology provided by INCORE-MED, the catalogue should integrate three databases or descriptive modalities.

- Database #1: Inventory of strategic and operational interventions of coastal from an integrated perspective, which involves intervention on marine and territorial spaces. This includes a list of options but does not specify project-level measures.
- Database #2: Integration of economic, social and environmental impacts to each of the adaptation options of database #1. This is mainly based on scientific and grey literature.
- Database #3: List of costs and benefits associated with each measure, based on the literature review. The SEC should collaborate with the DGCP and the CIIRC to harmonise the database according to the available data.

The DGCP developed a decision-making tool for municipalities based on a catalogue of coastal adaptation interventions. This catalogue needs to be adapted for the SWAP purposes and be available for stakeholder participation. The databases need to be based on scientific and grey literature, primarily on coastal erosion dynamics. However, the regional scale of intervention implies different needs for intervention descriptors, as the PPOL will not define specific operational measures at the municipal or project level but rather strategic and intervention logics for coastal archetypes.

2.2.6 Facilitation Resources & Processes

The DGCP will supervise and provide technical support to the participatory process and the facilitation company (FC) that awarded the public tender. The FC is responsible for delivering the PPOL's facilitation plan by December 2025 and implementing it in accordance with the public tender's terms of reference³³. This document is a legal mandate under urbanism law, with specific regulations on public participation that guarantee citizens' rights of initiative, information, and participation, among other principles³⁴.

This public participatory process is open to Catalan citizens, and all information about the PPOL's participatory process will be published on the official participation portal of the government of Catalonia in February 2026³⁵. The PPOL participatory process is organised into five coastal areas (see figure)³⁶ corresponding to the territorial planning units of the Catalan coastal area and covering 70 coastal municipalities.

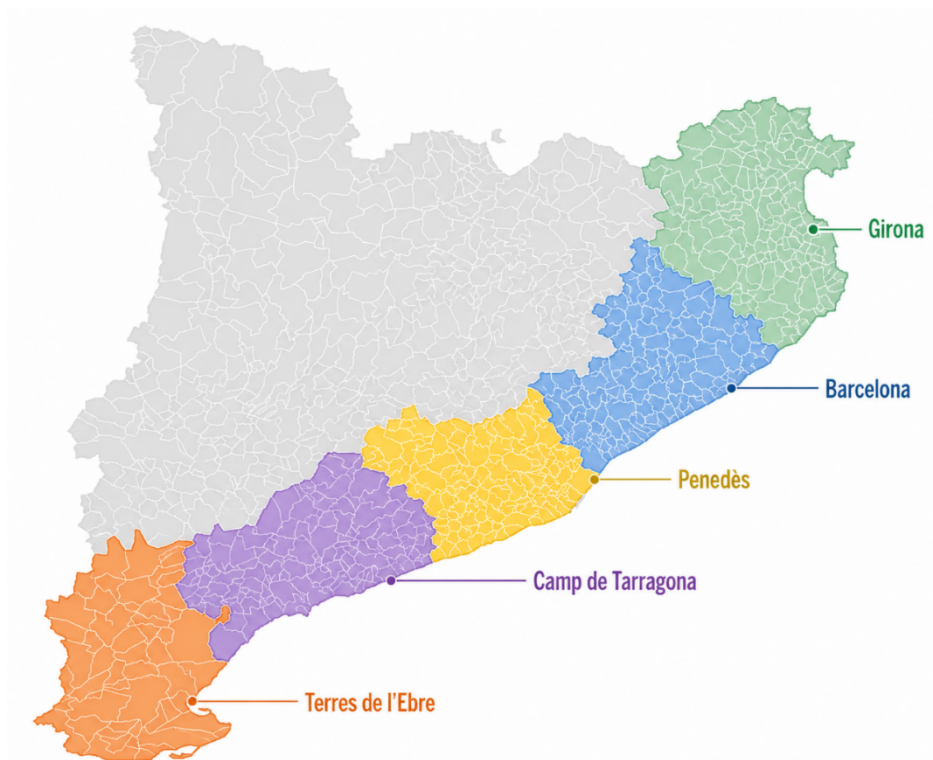


Figure 2: Administrative organisation by Vegueria of Catalonia (Data: INDESCAT; Cartography: [CNIG](#))

Participatory process structure and techniques

The facilitation plan addresses the needs of the SWAP process, including topics, processes, and deliberations. These needs were communicated by technical officers and eco-union, including: a

³³ This corresponds to the "Marc de referència del procés participatiu del Pla de Protecció i 'Ordenació del Litoral".

³⁴ "Guia per incorporar la ciutadania a les polítiques de la Generalitat. Planificar, executar i avaluar els processos de participació": <https://governobert.gencat.cat/ca/que-es/recursos-i-publicacions/guies-participacio-ciutadana>.

³⁵ <https://participa.gencat.cat/?locale=en>

³⁶ They are, from south to north: Terres de l'Ebre, Camp de Tarragona, Penedès, Metropolita de Barcelona, Comarques gironines.



draft version of this protocol, SWAP guidelines developed by the INCORE-MED project, and a three-hour online training session with the mentors. However, as mentioned above, the facilitation plan primarily responds to the needs of the PPOL participatory process, with the development of coastal adaptation pathways as one component, and prioritises the representativeness of social groups and territories. Another potential issue in the participation process for the SWAP method is the lack of full-day workshops on key method processes, such as consensus on common scenarios and co-design of adaptation pathways. Although the plan includes many sessions, it cannot guarantee that the same people will participate throughout. Given the technicalities of adaptation pathways, the limited time allocated to workshops might prevent participants from benefiting from co-learning and pose challenges for facilitators in building a consent-making process. The decision not to organise full-day workshops on scenarios and pathways was seen as a barrier to participation. This considers three initial constraints the facilitation company and the DGCP need to address: the limited time allocated to participation (approximately 6 months), the lack of economic compensation for participants, and the scope of territorial coverage and the diversity of topics. Although the PPOL's intervention at the regional scale does not require evaluation of local-level implementation, it could facilitate the development of generic guidance and intervention approaches for inclusion in adaptation pathways. These assumptions will be jointly assessed throughout with the PPOL's teams and the INCORE-MED partners.

The PPOL's participatory process will include 15 in-person debate sessions across the different coastal planning units, 10 virtual sessions with specific groups, self-managed debate sessions, and open online participation via a survey throughout the process. SWAP will be incorporated into some of them, either as a specific session or as a general session with a direct connection.

In the first phase, the participatory process will begin by communicating the process and issuing calls for participation. This includes:

- Publication of the Reference Frameworks: Objectives and principles of the participation program; Challenges of the DOP as an entry point to the debate; scenarios narratives for the general public; coastal archetypes; structuring sectoral models (Governance, adaptation, green infrastructure) and non-structuring models (Economy, mobility); PPOL's products.
- Update stakeholder mapping, define the inclusive participatory criteria and initial contact with the steering committee and experts.
- Catalogue of measures and territorial hypotheses.
- Development of workshop materials.
- Communication of the process oriented to all stakeholders is mapped and through the official website "participa.gencat.cat".

In parallel with the initiation stage, there is an **official institutional presentation** of the participatory process and the PPOL's Document of Objectives and Proposals. This will combine

virtual meetings with an in-person event across the five coastal planning units during February 2026. These meetings will be an opportunity to collect further expectations and engage institutions and other stakeholders in the process.

The subsequent phases concerning the implementation of the participatory process are structured as follows:

Table 4: PPOL's participatory process structure (inc. SWAP)

Participation Session	Sessions	Who	When	Format	Integration Issues³⁷
Territorial Scenario Workshop	5 Coastal Planning units	Local agents and the public	February – March 2026 3 hours	In-Person; 3 hours	Identification of scenarios based on coastal archetypes and planning areas.
SWAP Thematic Workshop	2	Experts	April – May 2026	Virtual; 2 hours	MCA to evaluate measures and tipping points
Pathways Workshop I	5 Coastal planning units	Experts Governments	June 2026	Virtual; 2 hours	Collect insights about adaptation pathways based on a structured debate
Pathways workshop II	5 Coastal planning units	Local agents and the public	July 2026	In person; 3 hours (³⁸)	Debate on the obstacles, viability conditions and impacts of the pathways.
Territorial workshops for feedback and validation	5 Coastal planning units	Local agents and the public	September 2026	In person; 2 hours	Final debate on the obstacles, viability conditions and impacts of the pathways (and other issues of the plan).
Final return session	1	Local agents and the public	September 2026	In person; 2 hours	Information and collection of final contributions.

³⁷ Integration Issues: SWAP is part of a major participatory process. We point at direct inputs for the SWAP process.

³⁸ Optionally, these sessions can be repeated in the morning to facilitate the participation of technical staff from the town halls.



Additional details are provided in the following chapters of this document. In general terms, the participatory events must incorporate: Sensitisation materials for participants, a short participation session guide for facilitators and coordinators, additional materials on context and rules of participation, support material for the development of the sessions, an attendance register, session evaluation forms, forms for authorising the use of personal data and image rights, consent forms and (virtual-analogic) participants' agenda; Note-takers.

Each session will produce a report that will be published on the official website of the participatory process. Additionally, eco-union will produce a short report from each session on the SWAP process, and a final report summarising all sessions.³⁹ At the end of the workshop, a short survey will be conducted with participants (mobile and analogue) to collect feedback on their satisfaction. The result will be included in the report.

2.2.7 Ethics in Data and Participation

Inclusive participation is approached in the terms of reference under which the awarded facilitation company must act. This includes the obligation to integrate the set of recommendations of good governance and gender inclusion that must guide the facilitation plan.

In terms of data management, the participatory process must comply with national and European data protection regulations, which also apply to the INCORE-MED project. For instance, the General Data Protection Regulation (EU) 2016/679 (GDPR) and its transposition into Spanish law through the Organic Law 3/2018, of 5 December, on the Protection of Personal Data and Guarantee of Digital Rights. In this line, to foster transparency and replicability, the data collection, storage, and analysis follow the FAIR principles: Findable, Accessible, Interoperable, and Reusable. The coordination team needs to appoint a data controller officer to monitor data management throughout the participatory process. All relevant documentation regarding the PPOL planning process, as well as the participatory reports, will be uploaded to the official participation portal of the Government of Catalonia.

A dedicated Data Management Plan (DMP) in INCORE-MED ensures secure handling, storage, and exchange of data collected during participatory activities. Data are stored in at least two secure repositories: the institutional cloud owned by the Catalan government and the eco-union's server. All documents related to the PPOL, including data collected during the participatory process, will be stored in the institutional cloud. Data will be labelled according to standardised file-naming protocols to ensure traceability and coherence. When applicable, data is encrypted and anonymised prior to sharing or analysis. Each INCORE-MED partner retains responsibility for managing its own datasets in accordance with institutional and national regulations. Only anonymised data, such as transcripts, photos, and videos from participatory sessions, may be reused for scientific or dissemination purposes, following explicit informed consent from

³⁹ This single document represents the D.2.1.1 Report on the SWAP participatory process.

participants. Consent forms, aligned with the Euro-MED checklist for surveys and public consultations, must clearly state the purpose, scope, and duration of data use.

The SWAP process is an analytical method grounded in participatory practice. A detailed description of the data requirements and process is now provided.

- Collection of audio and notes from virtual and in-person participatory processes.
- Collection of pictures, short videos and testimonies from participants and stakeholders.
- Collection of notes from follow-up and working meetings.

The analysis will integrate insights from workshops and meetings, highlighting recurring themes, areas of consensus, disagreement, and acceptance, and pointing to limitations and gaps in knowledge or inclusiveness. Outputs from participatory workshops will be evaluated to identify preferred pathways, measures, and tipping points per coastal area.

2.3 Phase II: Scenario Workshops

The Phase II - Scenario Workshop focuses on preparing and implementing the Scenario Workshop, a full-day participatory event that enables stakeholders to explore contrasting futures and collectively agree on a scenario to advance toward pathway development. It involves two steps: Developing Future Scenarios for the Workshop and implementing the Scenario Workshop Method.

2.3.1 Production of baseline & alternative scenarios

The DGCP, with support from the CIIRC research centre, will produce science-based pre-scenarios included in the **Document of Objectives and Proposals (DOP)**⁴⁰. The DGCP, through the DOP, will propose the leading scenarios to guide the definition of the pre-scenario narratives. Subsequently, the facilitation company will ground the pre-scenarios into narratives. Eco-union will support all teams through reviews and peer reflection.

Definition of scientific baseline scenarios.

There are two baseline scenarios proposed by the PPOL that are considered plausible trajectories (scenarios E0a and E0b), consistent with current knowledge and simplifying future uncertainty without obscuring it. These are:

- Baseline Scenario A (E0a), associated with SSP2–4.5, is based on the progressive consolidation of existing policies and instruments affecting the coastline.

⁴⁰ This corresponds to phase I of the agreement with the CIIRC research centre.



- Baseline Scenario B (E0b), associated with SSP5–8.5, unfolds in a context unfavourable to sustainability policies, which are partially implemented and lose weight in decision-making. It is a worst-case/ pessimistic scenario.

As a hypothesis, it is assumed that the SSP2–4.5 and SSP2–8.5 scenarios have the most significant technical consent, allowing the analysis to focus on two contrasting trajectories: a moderate one (SSP2–4.5) and a high-exposure, high-urgency one (SSP2–8.5). They are also the scenarios for which the most data, studies, and assessments are available at the Catalan level, facilitating their analysis for coastal territorial planning.

Departing from baseline scenarios, the PPOL's document of objectives and proposals⁴¹ outlines three approaches to scenario-making connected to the plan's three sectoral models⁴²: adaptation to climate change, green infrastructure, and governance. These sectoral models describe logics of intervention which will ground common visions and guide the selection of measures. The combination of these sectoral models will be different across archetypes and coastal planning units, shaping Catalonia's future coastal scenarios. The participatory process will help to make sense of these differences. In the case of coastal adaptation strategy, the PPOL's document exposes **7 logics of intervention** (strategic) that could be planned for each coastal archetype: 1) non-intervention, 2) advance and elevate, 3) protect, 4) retreat, 5) accommodate, 6) restore ecosystems, 7) integrate.⁴³

The final move is to define alternative coastal scenarios for implementing the PPOL, which will have to be collectively debated, modified, and contrasted within the plan's participatory programme framework. Based on narrative analysis developed by the DGCP officers, the **PPOL propose five alternative scenarios**: 1) Transform to continue; 2) A coastline like the one of old; 3) Allian with nature; 4) An elastic coastline; 5) A regenerative coast. These five scenarios are also connected to diverse logics of intervention that configure the three PPOL's sectoral models of adaptation, green infrastructure, and governance.

The participatory scenario-making process will challenge participants to imagine how the baseline scenarios would change if new public policies were applied. Participants will be asked to reflect and debate on 5 ideal scenarios proposed by the PPOL for the coastal planning area and the coastal archetype. They will be asked to identify and vote on the conditions, triggers, and obstacles that must be met for the selected ideal scenarios to become real.

⁴¹ Document d'Objectius i Proposicions (DOP)

⁴² By the sectoral model the PPOL refers to strategic policy areas of intervention.

⁴³ Governance and Green Infrastructure also incorporate different logics of intervention. These are accessible in the DOP.

Territorial Scenario Workshops

The workshops will integrate the three coastal dispositions of the plan (adaptation, green infrastructure, and governance) with other political issues, such as the economy and mobility, across the five coastal planning units and four coastal archetypes.

- Objectives: to build a shared diagnosis and foster an initial debate on the scenarios, the challenges they present, the current situation and the desired future situation.
- Modality: 5 in-person workshops of 3 hours each for the coastal planning unit.
- Methodology: Definition of challenges and hypothesis testing. Specific techniques and processes for definition.
- Facilitators and supporters: 2 expert facilitators with the support of government officers, CIIRC and eco-union. The allocation will be adjusted according to the number of participants.
- Materials: Infographics with coastal archetypes and coastal maps for each coastal planning unit.
- Setting: public venue

Analysis of results and translation into pathways design

The results should provide consensus on ideal scenarios for the coastal archetypes used in the workshops. These outputs should already consider climate projections and modelling inputs. The reports from facilitators and observations from INCORE-MED will be assessed internally and fed back into modelling exercises and selection of interventions for the prioritisation workshops. It is important to be mindful of the risks associated with scenario workshop results, particularly when establishing a clear consensus on scenarios and guiding the next phases. Potential corrective measures could be necessary to ensure compliance with the SWAP method.

2.4 Phase III: Building the Pathways

Phase III - Building the Pathways represents a critical “in-between workshops” stage, where the team leading the process transforms consensus scenarios into tangible, science-grounded, and stakeholder-relevant adaptation pathways. The output is a visual, structured Adaptation Pathways diagram that illustrates different sequences of measures over time under the chosen scenario(s), highlights moments for critical decisions, and outlines conditions that would trigger a shift in strategies.



2.4.1 Selection, Prioritisation & Evaluation⁴⁴

The next stage involves working through the catalogue of measures to identify, prioritise, and evaluate adaptation/mitigation interventions against coastal erosion processes, and to use archetypes across the five coastal planning units. Multicriteria Analysis and Cost-Benefit analysis are used as guiding methods in workshops. However, it is not yet clear how these methodologies will be disclosed until the facilitation company delivers specific workshop plans. These workshops are organised in April-May in in-person, virtual, and self-organised modalities, open to broad participation and selected stakeholders. The catalogue of measures (database #1, #2, #3) needs to be delivered at this stage for sharing with the participants, respectively. By the end of this process, the DGCP and the CIIRC will be able to design the initial adaptation pathways and tipping points based on the prioritised interventions per archetypes and coastal areas. Additionally, the facilitation company will support the organisation of self-organised workshops to select and prioritise measures.

Territorial Prioritisation Workshops⁴⁵

The focus will not be on adaptation, governance and green infrastructure measures.

Objectives: To move from “what's happening / what we'd like” to “what needs to be done and in what order”. In practice, these workshops aim to define and prioritise evaluation criteria of coastal adaptation interventions per coastal archetype

- Modalities: 5 in-person workshops of 3 hours, one for each coastal planning unit.
- Methodology: Co-creation of prioritisation criteria and prioritisation of actions. Specific facilitation processes for definition.
- Facilitators and supporters: 2 expert facilitators with the support of government officers and eco-union. The allocation will be adjusted according to the number of participants.
- Materials: The database #2 on impacts, organised in a PDF document, is previously shared with the participants along with the workshop's instructions and the report from the previous participatory session.
- Setting: public venue

Multicriteria Analysis Workshop with experts⁴⁶

The focus of these sessions is to work with the selected stakeholder group on MCA. This will complement the territorial and self-organised workshops on MCA, ensuring more consistency towards the adaptation pathways and the calibration of the catalogue of interventions.

⁴⁴ This corresponds with the “Phase II Prioritisation of actions and models” of the PPOL's facilitation plan.

⁴⁵ It corresponds to the “Tallers de priorització territorial” of the PPOL's facilitation plan.

⁴⁶ It corresponds to the “Tallers Tematics SWAP” of the PPOL's facilitation plan.

Objectives: Prepare the technical basis for developing adaptation pathways (climate change adaptation, risks and ecosystems)

- Modalities: 2 virtual workshops of 2 hours with selected stakeholders.
- Methodology: evaluation of interventions includes positive and economic impacts (economic, social and environmental) of interventions against coastal erosion, which participants need to evaluate using the same numerical scale used in the MCA.
- Facilitators and supporters: 2 expert facilitators with the support of government officers, SEC and eco-union. The allocation will be adjusted according to the number of participants.
- Materials: a list of criteria and a catalogue of coastal adaptation interventions, organised in a PDF document, was previously shared with the participants along with the workshop's instructions and the report from the previous participatory session.

Translation of results into the SWAP process

The outcomes from workshops will be delivered to the [participa.gencat⁴⁷](https://participa.gencat.cat/), including the prioritised interventions, and a report with MCA results. Additional data analysis will be conducted by the DGCP, CIIRC, and eco-union to extract insights from the MCA. The MCA will prioritise social criteria and interventions aligning with the five coastal planning units and archetypes to build coastal adaptation pathways. The MCA will also provide the key terms of reference for the building assumptions behind the socioeconomic evaluation and for the tipping points across temporal scales. Post-event meetings will be organised to discuss the results with the CIIRC and the subcontractor team for socio-economic analysis, to translate the results into modelling measures across temporal scales and to define tipping points.

2.4.2 Modelling Techniques & Process

The catalogue of interventions and the modelling will be led by the CIIRC centre under the supervision of the PPOL coordinator. The conceptual modelling exercises supporting scenario development and the assessment of temporal coastal behaviour under different interventions will be based on representative coastal archetypes⁴⁸ and prioritised climate scenarios. There will be modelling of biophysical coastal changes due to global warming, as well as modelling incorporating MCA and socio-economic inputs. The integration of the socio-economic consultancy (SEC) should provide input to and receive feedback from the MCA workshops. During the modelling of adaptation pathways, a cost-benefit analysis of selected interventions may be conducted to inform the selection of the preferred adaptation route.

⁴⁷ <https://participa.gencat.cat/>

⁴⁸ A coastal archetype is a stretch of coast that shares characteristics in morpho-hydrodynamic and land/marine uses and must be interpreted in a generic way, but is recommended for describing stretches of a highly complex coastline.



The modelling exercise will be complemented by prioritised scenarios for each coastal archetype (as used in the workshops), which will inform the definition of tipping points for each archetype in the PPOL. Trends and potential tipping points are identified in terms of:

- Change in the coastal response to climate drivers (increasing coastal flooding, more frequent and intense extreme events): loss of protective beach width, dune and barrier overtopping or breaching, permanent flooding of low-lying areas, and degradation of key ecosystems such as wetlands and seagrass meadows.
- Thresholds of the adaptation solutions: availability of accommodation space, budget constraints, availability of sand deposits and freshwater volumes, and social acceptance of landscape transformation.

A first scientific modelling process will help define scenarios for coastal evolution, taking into account the contribution of climate change in the SSP2-4.5 and SSP5-8.5 scenarios, respectively, the retreat induced by a sequence of storms, and the basal erosion of the archetype. This exercise will consider the expected value or average risk based on biophysical changes in waves and sea-level rise due to global warming, and the economic cost of damage (vulnerability attribute) due to a combination of (base or continuous) erosion and storms. The challenge with the obtained values is their adjustment to morphological criteria, selected storms, and erosion rates representative of the archetypes, vis-à-vis the uncertainty of changes and the comparability among archetypes across coastal planning units.

ΔX_{SLR} : The beach-width recession caused by the rise in mean sea level due to global warming is assessed using a Bruun rule adapted to the PPOL's coastal archetypes.

ΔX_{Storms} : a combination of selected storms with a 50-year and a 100-year return period, based on the recorded wave data.

$\Delta X_{Erosion}$: erosion rates and an asymptotic factor since the setbacks in the 1995–2005 decade.

These modelling exercises should support the scenario workshops during phase II of the SWAP process, reinforcing the baseline impacts on the Catalan coast. If this is not possible for phase II, the modelling of baseline scenarios can be shared to integrate a scenario-learning moment during the prioritisation workshops (MCA/CBA).

A second modelling moment occurs after the MCA and socio-economic evaluations, when the CIIRC models the impact of selected interventions/measures on the biophysical behaviour of the coastal area and on the impacts of extreme weather events. This moment precedes the Adaptation Pathways workshop.

2.5 Phase IV: Adaptation Pathways Workshops

This phase activates stakeholders and opens participation in the final design of coastal adaptation pathways. It expects to collect insights from coastal municipalities, select stakeholders, and participation from the five coastal planning units. Additionally, the facilitation company will support the organisation of self-organised workshops to select and prioritise measures.

2.5.1 Tipping points workshops

There are two modes of participation accompanying the pathway design in June. Due to the limited time per session, the workshops will focus on gathering perceptions and debating the potential implications of tipping points and interventions across the temporal spectrum of pathways, aiming to calibrate tipping based on archetypes. Additionally, the self-organised workshops might provide space to collect further insights into the allocation of tipping points and intervention blocks by archetype.

Workshops with Administrations and Experts

This is a very important moment when key players legitimising the PPOL will have the opportunity to provide territorial and expertise insights to the design of tipping points, enabling long-term intervention planning across coastal archetypes and planning units.

- Objectives: develop the PPOL adaptation pathways.
- Modalities: 5 virtual sessions of 2 hours with institutions and selected stakeholders across coastal planning units.
- Methodology: review of the tipping points for specific interventions and deciding on the temporality of measures and the combination with others.
- Facilitators and supporters: 2 expert facilitators with the support of government officers, CIIRC and eco-union. The allocation will be adjusted according to the number of participants.
- Materials: the coastal pathways for each archetype defined by the CIIRC and PPOL's team, and a blank pathway map to work on. Each pathway map includes a list of modelled interventions and an icon legend.



Territorial Pathway Workshops with open participation

Building the pathway's maps, calibrated through workshops with administrations and experts, the next step is to open participation using the same facilitation process while integrating contextual insights from coastal planning units.

- Objectives: develop the PPOL adaptation pathways.
- Modalities: 5 in-person sessions of 3 hours across the five planning units.
- Methodology: discusses obstacles, feasibility conditions, and the social and territorial impacts of the developed adaptation routes.
- Facilitators and supporters: 2 expert facilitators with the support of government officers and eco-union. The allocation will be adjusted according to the number of participants.
- Materials: the coastal pathways for each archetype defined by the CIIRC and PPOL's team, and a blank pathway map to work on. Each pathway map includes a list of modelled interventions and an icon legend.

2.5.2 Modelling the Pathways

The prioritisation of measures will lead to a final catalogue of interventions and a selection based on prioritising PPOL's scenarios. The coastal adaptation interventions were previously evaluated for technical, economic, and social readiness through workshops, expert consultations, and the SEC team, which will inform the intervention's adaptation logic for coastal planning units and archetypes. At this stage, there is the final modelling moment, which is more iterative across workshops, accompanying the definition of tipping points per archetypes and the modelling of interventions.

The scientific modelling exercise follows the prioritisation and evaluation of interventions for each coastal archetype, as provided by MCA workshops and expert meetings. The selected interventions will be modelled, departing from the previous modelling exercise. This third moment is more iterative and may involve several interactions to test assumptions, calibrate impact functions among PPOLs and CIIRC teams, and consult with key stakeholders. This iteration will be implemented before and after the territorial adaptation pathways workshops. From an economic evaluation perspective, the most important moment is between workshops, when the SEC team needs to provide appropriate data and models to adequately translate biophysical impacts into economic impacts. This exercise will provide the first maps of adaptation pathways. This output will be shared and discussed with experts and municipal officials. In this case, participants will debate tipping points and the combination of interventions integrating local and expert perspectives. Their insights will produce an adapted version of the pathways maps.

The new version will be discussed with participants through the territorial workshops, digging deeper into the diverse coastal planning units. This second participatory exercise will lead to the final modelling of the adaptation pathways. The final adaptation pathways maps should be shared with the pool of experts to obtain a final validation before presenting in the final round of validation sessions for each territory.

2.6 Phase V: Validation, Integration & Dissemination

The final phase involves validating with participants and stakeholders before the final technical modification to the pathways. The final delivery of outputs from the process will take place, as well as the final return from the participatory process.

2.6.1 Validation events

Two events are designed to gather final insights and provide feedback on the participatory process.

Territorial meetings for feedback and validation

The territorial workshops are the final opportunity for the participants to share insights on the adaptation pathways from each planning unit.

- Objectives: Presentation and validation of the results with the option to follow them live and ask questions via videoconference.
- Modalities: 5 hybrid sessions of 2 hours across the five planning units.
- Methodology: discusses obstacles, feasibility conditions, and the social and territorial impacts of the developed adaptation routes.
- Facilitators and supporters: 2 expert facilitators with the support of government officers and eco-union. The allocation will be adjusted according to the number of participants.
- Materials: the coastal pathways for each archetype.

Final return session

This is the final in-person event closing the participatory process.

- Objectives: The presentation of the results and impacts of the participatory process to stakeholders and interested parties will also be carried out by the plan's promoter unit, as it will take place alongside the exhibition of the initially approved Coastal Protection and Management Plan.



- Modality: single in-person event of 2 hours.
- Methodology: information and final collection of insights.
- Materials: final coastal archetypes.

2.6.2 Final Outputs

The SWAP implementation will lead to the development of coastal adaptation pathways for the Catalan coast and will be integrated into Catalonia's Coastal Protection & Management Plan. Other materials of dissemination will be published.

Catalan Coastal Adaptation Pathways Book (CC3AP)

This deliverable corresponds to the INCORE-MED project delivery 3.2.1. The document will be delivered in an informative format oriented to stakeholders and the public. The CC3AP book will describe the full elaboration process within the participatory process, making the technical process accessible to a wider audience of planning practitioners and coastal communities. The DGCP will co-edit the book with eco-union and publish it on participa.gencat or another official PPOL repository. The DGCP will adapt this book to the institutional format of the PPOL planning document and provide a summary of the adaptation pathways. Additionally, the knowledge base on modelling databases, bibliographic databases, the catalogue of measures, and other materials will be uploaded to an open-access repository to support future SWAP processes.

Other communication materials

Eco-union, in collaboration with other INCORE-MED partners, will develop additional communication materials to disseminate information about the SWAP process through various channels and for diverse audiences. The DGCP will be included in the planning for the edition of these materials to ensure alignment with the PPOL's communication requirements and objectives.

- **Video:** short video of INCORE-MED where the SWAP processes will be briefly introduced, along with images and videos collected through the participatory process. This material is oriented to the Interreg Euro-Med community and will be published in English with subtitles.
- **Booklet:** a three-page booklet explaining the SWAP process in Catalonia. This material will be edited in Catalan and English and is oriented to diverse audiences.
- **GIS Story Map:** eco-union will collect and analyse data from the participatory processes, emerging narratives on coastal scenarios and pathways to support future SWAP processes along the Catalan coast. This output will be digitised and made available in open access, in Catalan and English.



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