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Adapting Marine Protected Areas (MPAs) to Climate Change

Building Resilience with Marine Protected Areas (MPAs) in Catalonia, Spain

The Parc Natural de Cap de Creus and the Litoral del Baix Empordà Natura 2000 site implemented climate change adaptation measures in their Marine Protected Areas.

Key Learnings

- **Tackling the challenge of finding tailor-made solutions:** climate change's impacts on the ocean, such as warming water temperatures, are increasingly capturing public attention. Involving representatives of different marine sectors contributes to finding solutions for each sector. However, this is a complex task as climate change affects each sector differently.
- **Data as an essential prerequisite:** In addition to marine biodiversity monitoring data, the physical and chemical parameters of the sea must be available for developing climate change adaptation plans. A comprehensive monitoring system, in combination with protection and restoration plans, is required for effective protected area management.
- **Drafting measures in a participatory way reduces the potential for conflicts:** Most of the suggestions for measures in the Adaptation Plans were made by the participants during the workshops and are based on consensus.

About the region

Catalonia is in the northeastern part of Spain and borders Andorra and France. Catalonia has approximately 8 million inhabitants (2023). Barcelona is the largest city with over 5.8 million people living there. The landscape is characterised by mountain ranges and extensive coastlines of about 600km with high biodiversity. Parc Natural Cap De Creus is in the northeastern part of the Iberian Peninsula and the Litoral del Baix Empordà Natura 2000 site is south of the natural park.

Climate Hazards

Extreme Temperatures, Sea Level Rise

Sector

Biodiversity, Coastal Areas, Marine and Fisheries

Key system

Ecosystem and Nature Based Solutions



Climate Threats

The Mediterranean Sea is warming 20% faster than the global average and predictions estimate that by 2040 the average annual temperature will be 2.2°C warmer than during the pre-industrial period. Currently, 90% of the commercial fish stocks in the Mediterranean area are overexploited despite its importance as a biodiversity hotspot. Warmer waters alter species composition and abundance. For instance, cold-water species are becoming less abundant and migrating, and warm-water species are spreading and displacing cold-water species, severely impacting marine ecosystems. Warming water temperatures can also lead to mass mortality events, as happened, for example, in 1999. Between 1970 and 2006, sea level rise accelerated to 1.1 mm per year, leading to coastal floods and erosion. CO₂ uptake is another threat to the Mediterranean Sea, which causes an acidification of the seawater and threatens corals and shell-building organisms.

Marine-protected areas of the Mediterranean at the forefront of adaptation to climate change

To achieve climate change resilience in the Mediterranean Sea ecosystems, a participatory approach was undertaken. This involved the use of citizen science, harmonised monitoring of climate change impacts, vulnerability assessments, and developing climate change adaptation plans for each marine protected area, two of which are in Catalonia.

Citizen scientist's and fishermen's participation is critical to climate change adaptation in marine areas. Fishermen are one of the Mediterranean Sea's most influential user groups, impacting species numbers. The stakeholders involved were positive about establishing the marine protected areas because they were consulted early.

Establishing healthy and protected marine areas is important for climate change adaptation and supporting economic resilience to climatic hazards.

"Good health and good conservation status of marine areas is the basis for achieving resilience to the effects of climate change on marine ecosystems and their associated economic sectors. Hence, this underlines the importance of marine protected areas as strategies for adaptation to climate change."

Gemma Cantos Font, Catalan Office of Climate Change

Catalonia Pilot Sites: The four phases of adaptation planning

Climate Change Adaptation Plans aim to reduce an area's vulnerability by improving or restoring natural habitats. The process underwent four phases to achieve a tailor-made adaptation plan in each pilot site.

Phase 1

As a first step, the project team focused on drawing up an adaptation plan and identifying a body for (global) planning coordination among all pilot sites within the MPA-Engage project. A core team was established with a mandate to prepare and implement the plan locally. The project team identified stakeholders and designed a stakeholder engagement process. In total, the stakeholder engagement process involved eight actions.

1. Setting up a [webpage](#) for sharing information about the MPA-Engage project and the project activities.
2. Organising a webinar to introduce the MPA-Engage project, its aims, framework, primary actions, and expected results to the stakeholders (identified in the stakeholder mapping process).
3. Keeping the stakeholders updated about the project activities through social media channels.
4. Developing and disseminating regular press releases on project activities.
5. Organising a public meeting.
6. Setting up an online survey, asking stakeholders to shortlist priority actions from a list of potential actions that should be included in the climate change adaptation and mitigation plans.
7. Organising a consensus meeting to discuss the survey results in a dialogue between experts and participants, which resulted in a draft plan.
8. Organising a final webinar to share the contents agreed-upon of the climate change adaptation and mitigation plans.

Phase 2

During the second phase, the project team conducted a climate risk assessment. They prepared scenarios to assess the future impacts of and vulnerability towards climate change in the marine areas. The sources used included information from relevant pre-existing plans and stakeholder involvement.

Eleven monitoring protocols were generated. The following topics were covered in the protocols: Temperature, Mass Mortality, Local Ecological Knowledge (protocols 3, 4, and 6), Visual Census of Fish, *Posidonia oceanica* Conservation Status, *Pinna nobilis* Conservation Status, Sea Urchin Populations, Rapid Detection of Invasive Benthic Species, and Photogrammetry. The monitoring protocols were shared with local stakeholders to collect the data, which scientists and managers had defined as the most important monitoring needs for each marine protected area. In some cases, disagreements about details for implementing the protocols arose, but through discussion and consensus, the disagreements were resolved.

An online seminar on marine citizen science was organised for stakeholders, and diving instructors were trained to become citizen scientists by applying the new [PADI citizen science module](#): Basic Research Operators. During the module, the participants learned about the importance of citizen science for marine conservation and its added value to diving. In addition, the diving instructors were trained to develop skills and abilities for establishing and implementing specific citizen science actions. Two examples were used to provide scientific training on how to set up a monitoring protocol.



Figure 1: Citizen Science training course in Cap de Creus Natural Park. (Image Credit: Fabio Figurella, PADI EU).

Climate change risks result from the dynamic interactions between climate-related *hazards* and *exposure* and *vulnerability* of the affected human or ecological system. A vulnerability assessment reveals how sensitive a system is towards the impact of climate change and how well it can adapt to harm. The socio-ecological vulnerability assessment combines ecological vulnerability (species and habitats), social sensitivity (users), and adaptive capacity. The project team assessed each marine protected area and elements (species, etc.). The advantage of this methodology is that it is replicable and can be adapted over time, which makes it possible to track changes and enable adaptive planning. More information on the vulnerability of species, habitats, and users can be found [here](#).

Phase 3

The third phase established a vision for each marine protected area. The aim was to reach commitment and consensus with the stakeholders and participants on the action plan based on the conclusions from the previous phases. The action plan identified key problems and issues that needed to be addressed. The stakeholders agreed upon the outline of the plan and its implementation. The participants of the workshops developed 18 out of 24 actions collaboratively, and the participants' [portal](#), which was designed explicitly to facilitate participation, enabled the development of the other actions. Almost everyone involved in developing the action plan participated in most sessions, resulting in fruitful discussions.

Phase 4

The final phase was the preparation and finalisation of the local climate change adaptation plan for each Marine Protected Area. Stakeholders discussed, finalised and adopted the adaptation plans during workshops. The participatory approach resulted in agreement on tailor-made adaptation plans in each pilot site. The adaptation plan included thirteen priority actions for addressing climate change in the Cap de Creus site, for example, promoting citizen science programmes, monitoring activities with support from local fishermen, and implementing restoration programmes. In Litoral del Baix Empordà, the 25 actions included raising awareness and disseminating activities related to the effects of climate change, implementing long-term habitat monitoring programmes, and establishing suitable anchoring areas for boats.

Summary

Marine Protected Areas (MPAs) and marine biodiversity in the Mediterranean Sea are severely affected by climate change. The participatory project MPA-Engage was implemented at two sites in Catalonia, Spain, the Parc Natural de Cap de Creus and the Litoral del Baix Empordà Natura 2000 site, to contribute to putting Mediterranean marine protected areas on the front line of adaptation strategies to address climate change. In addition to generating monitoring protocols, a socio-ecological vulnerability assessment was used to develop a Climate Change Adaption Plan for each site. The stakeholder engagement process contributed to the success of this climate change adaptation project. Further monitoring should facilitate tailor-made adaptation mechanisms.

Further information

The work presented in this adaptation story is part of the “[MPA-Engage](#)” project.

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- <https://refredaelmar.cat/en/>

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