

**Climate Change in Mediterranean MPAs:
 fast-tracking actions for effective management
 and enhanced resilience in a changing ocean**
Policy Paper

MPA ENGAGE

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1. Setting the scene

1.1. CLIMATE CHANGE IN MARINE PROTECTED AREAS

Climate change is dramatically affecting the Mediterranean Sea, which is warming three times faster (0.41°C per decade) than the world’s average rate (0.13°C per decade) (IPCC, 2019, Pisano et al., 2020). Climate change is amplifying the effects of existing threats to marine ecosystems and is reshaping their biophysical and chemical characteristics, from increased water temperature, sea-level rise, and extreme events, to ocean acidification, with serious consequences for natural systems (Cramer et al. 2018, Grorud-Colvert et al., 2021). The Mediterranean marine ecosystems are experiencing the following macroscopic and measurable impacts: (i) the shift towards more thermophilic biota; (ii) an increased vulnerability to tropical invaders; (iii) the increased occurrence of phenological shifts; (iv) the occurrence of unprecedented large-scale mass mortality events (Cramer et al., 2018; Garrabou et al., 2019; D’Amen, M., & Azzurro, E., 2020; MedECC, 2020).

This rapid transformation of the Mediterranean biota, is producing a novel scenario in which multiple and combined pressures are increasingly eroding the functioning and health of marine and coastal ecosystems, impacting the multiplicity of ecosystem services that the Mediterranean society relies on such as food production, flood and erosion control, carbon storage, sequestration and water quality.

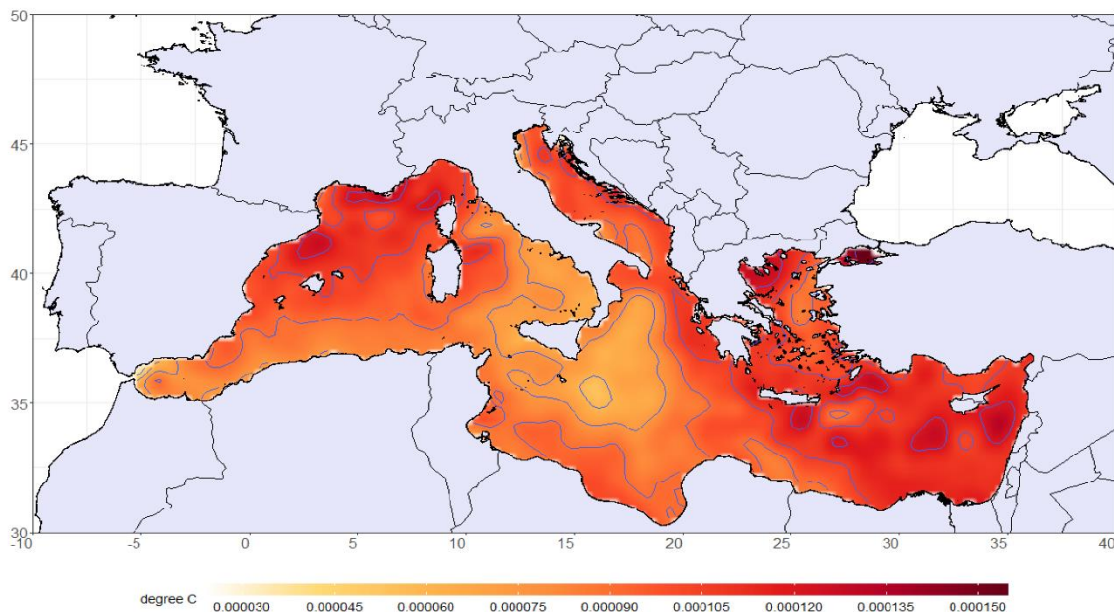


FIGURE 1-1. Daily warming trend in the Mediterranean basin from 1982 to 2019. Each contour denotes a change of 1.5×10^{-5} °C/day. (Pastor et al., 2020).



By only covering 0.82% of the ocean surface, the Mediterranean Sea supports a high level of biodiversity, including about 18% of all known marine species and its rapid warming, in synergy with other climate and non-climate related drivers, threatens some key ecosystems that have high vulnerability to such pressures (e.g., coralligenous, Posidonia habitats, marine caves, infralittoral habitats) (Coll et al. 2010, MedECC, 2020). Despite the designation of Marine Protected Areas (MPAs) to effectively protect such ecosystems and the nature-based solution they offer to support efforts towards climate change adaptation and mitigation, they also experience the widespread and pervasive effects of climate change that may challenge their effectiveness to fully protect biodiversity. In fact, several Mediterranean MPAs are already facing major biodiversity and functional alterations due to climate change, whereas others will likely directly face them in the next few decades (Gomez-Gras et al., 2021).

Even though it is difficult to foresee with precision to what extent the current climatic trends will affect the effectiveness of Mediterranean MPAs and their ability to meet their biodiversity and conservation goals now and in the future, most recent studies indicate the increased risk of extinction of endemic fauna, loss of habitat complexity and changes in ecosystem configurations, while the socioeconomic effects are not well-studied yet. Consequently, climate change requires a more concerted effort by Mediterranean conservation strategies and management to restore, preserve, and protect the ecological integrity and resilience so MPAs can adapt to environmental changes and withstand the additional stress of climate change.

There is an overwhelming scientific consensus that supporting marine conservation under climate change is one of the grand challenges for the coming decade (Borja et al., 2020). The Mediterranean MPAs face an urgent need to pursue evidence-based solutions to the biodiversity decline and the unprecedented pressures from climate change in the region. There is, therefore, an imperativeness to mitigate these risks and to consider adaptation options in partnership with local communities, decision-makers, civil society organizations, research bodies, and other socio-economic actors at local, national and regional level.

1.2. THE ROLE OF MARINE PROTECTED AREAS IN THE FACE OF CLIMATE CHANGE

MPAs are recognised as one of the strongest and effective tools for protecting marine life and the livelihoods of coastal communities (Sala et al., 2021). While the effectiveness of MPAs to halt global climate change impacts has been questioned (Bruno et al., 2018), there is growing evidence for their role as important areas for enhancing the resilience and adaptive capacity of ecosystems (Tittensor et al., 2019). The long-term, place-based nature of MPAs provides an advantage in addressing the impacts of climate change by providing a focal area for management and science to reduce stressors, to monitor conditions and trends, and engage with the public (Simard et al., 2016). MPAs and related networks that work together to meet objectives beyond those of a single area by protecting areas from degradation and allowing the recovery of ecosystems can contribute to addressing climate change through a number of different routes:



- ▶ Reduce other non-climate ocean stressors
- ▶ Function as important carbon sinks
- ▶ Provide ecologically connected corridors for shifting species distribution
- ▶ Provide refuge and replenishment zones
- ▶ Reduce risk and promote resilience
- ▶ Serve as sentinel (research) sites to monitor climate change effects
- ▶ Raise awareness and educate local communities
- ▶ Provide numerous ecosystem services

MPA management and planning that ignore potential climate change impacts or that are based on unrealistic generalizations, might result in conservation targets or indicators that are unlikely to be achieved (Katsanevakis et al., 2020). However, despite recognition of the importance of integrating climate change as a core consideration for MPA planning and implementation, and the development of conceptual approaches and decision support tools for over a decade, the uptake of these measures into management and policy appears limited and/or uncoordinated (Tittensor et al., 2019). The latest Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment indicates that there are “few protected areas whose objectives and management take climate change into account” while only limited studies exist on this issue, with no comprehensive synthesis (Rilov et al., 2020; IPBES, 2019).

As MPAs need to anticipate and prepare for the socioecological effects of climate change, they require adaptive management to enable them to tackle problems, while they are still manageable. In order to be effective and to better understand the transboundary impacts of climate change, monitoring programmes targeting multiple indicators for ecological and social effectiveness in MPAs are essential. Long-term monitoring is necessary to fill in the data gaps, in particular in terms of distinguishing natural variability and climate change impacts on biodiversity at multiple levels. Such data will shape future adaptation and mitigation scenarios, but given the threats from climate change and the need to act urgently, actions should be undertaken on the basis of available information, while also advancing, strengthening and deepening the associated knowledge base (Simard et al., 2016).

Participatory engagement of local communities in all steps of this anticipatory process is perhaps the most important component to ensure increased support and long-term sustainability. It is essential to provide and encourage climate-smart management around the principles of inclusiveness and capacity transfer, to enable cross-sectoral sharing of successful experiences and best management practices, while promoting regional cooperation for the management of climate change resilient MPAs.



2. The MPA Engage project in a nutshell

In order to address some of the aforementioned challenges, the MPA Engage project kick-started in 2019. MPA Engage is an Interreg Med funded project seeking to support Mediterranean MPAs to adapt to and mitigate the ongoing climate change effects in the Mediterranean Sea. Within a period of three years, MPA Engage has provided essential support to managers of marine protected areas to fast-track actions against climate change. During this time, MPA managers and climate change experts from 14 entities and 6 different countries, namely Albania, Croatia, France, Greece, Italy and Spain have been brought together and have evolved into a taskforce with the joint mission to promote MPAs as nature-based solutions for climate change adaptation.

The MPA Engage project entailed testing, transferring and capitalization activities that were coordinated by CSIC. The ultimate goal of the MPA Engage project was to support managers of the pilot MPAs in managing the cumulative impacts of climate change on their areas via the definition of an effective societal response. To this end, harmonized and novel tools were provided to the pilot MPAs to facilitate the implementation of 5-fold pilot actions, which focused on:

- ▶ Harmonized monitoring of the climate change effects and impacts in MPAs (Led by SZN);
- ▶ Assessment of the ecological and socio-economic vulnerability of MPAs to climate change (Led by UVIGO);
- ▶ Engagement of local communities in citizen science activities to monitor the climate change effects and impacts in MPAs (Led by UNIVPM);
- ▶ Engagement and mobilization of all key actors of the quintuple helix participatory framework (Led by MIO-ECSDE);
- ▶ Elaboration of climate change adaptation plans (Led by MIO-ECSDE).

The 7 pilot MPAs of the project that implemented the aforementioned activities were the following: Brijuni National Park (Croatia), Portofino MPA (Italy), Calanques National Park (France), Zakynthos MPA (Greece), Cap de Creus MPA (Spain), Litoral del Baix Empordà MPA (Spain) and Tavolara Punta Coda Cavallo MPA (Italy).

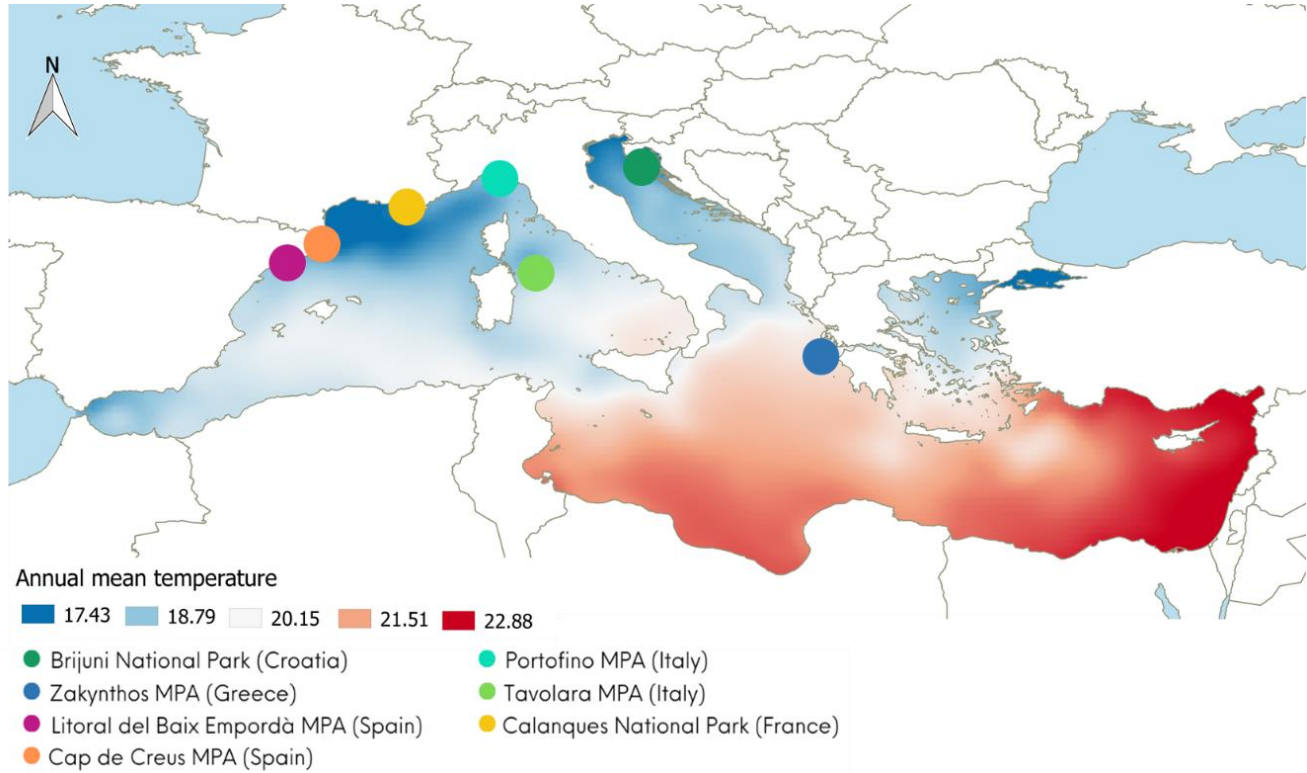


FIGURE 2-1. Map of the Mediterranean Sea, with the mean annual surface temperature and the location of the 7 pilot MPAS. The temperature data are extracted from Borja et al., 2017.



3. The policy context

The main policy and legislative frameworks for specific actions against climate change at Mediterranean, European, EuroMediterranean and global levels are briefly presented below.

At Mediterranean level:

- ▶ **Mediterranean Strategy for Sustainable Development (MSSD 2016-2025):** MSSD provides a strategic framework for all stakeholders and partners to translate the 2030 Agenda and the SDGs into progress towards a low-carbon and resilient Mediterranean region. The fourth objective of MSSD is "Climate Change as a priority issue for the Mediterranean".
- ▶ **Regional Climate Change Adaptation Framework for Marine and Coastal Areas (RCCAF):** Adopted in 2016, this instrument developed by UNEP/MAP charts a regional approach to bolstering the resilience of the natural and socio-economic systems in the Mediterranean region.
- ▶ **Integrated Coastal Zone Management:** Adopted in 2008, the ICZM Protocol provides a legally binding instrument for coastal zone protection, including through the prevention and reduction of the effects of climate change.
- ▶ **The Ecosystem Approach (EcAp):** The EcAp process seeks to reach the ultimate objective of achieving Good Environmental Status (GES) in the Mediterranean Sea. To this end, contracting parties have agreed to protect and restore the structure and function of marine and coastal ecosystems thus also protecting biodiversity, in order to achieve and maintain good ecological status and allow for their sustainable use. In addition, they have committed to prevent, reduce and manage the vulnerability of the sea and the coasts to risks induced by human activities and natural events. Five ecological objectives (1,2,3,4,6) are relevant for marine protected areas. The Integrated Monitoring and Assessment Programme (IMAP) foresees indicators for monitoring and assessment of the environmental status in relation to the aforementioned objectives; some of these indicators are related to climate change effects (i.e. Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species).
- ▶ **Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO):** The Post-2020 SAPBIO is designed to be action-oriented and made of activities tailored towards realistic objectives that countries could reasonably achieve. The Post-2020 SAPBIO includes the Post-2020 Regional Strategy for Marine and Coastal Protected Areas (MCPAs) and other effective area-based conservation measures (OECMs) in the Mediterranean and adopted the 30x30 target to achieve 30% protection coverage by 2030.



At European level:

- ▶ **Habitats and Birds Directives:** The main legal instruments for the designation and management of MPAs in Europe.
- ▶ **Biodiversity Strategy for 2030:** The EU's biodiversity strategy for 2030 is a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030, and contains specific actions and commitments. The Strategy sets the target of protecting 30% of European Seas by 2030.
- ▶ **Marine Strategy Framework Directive (MSFD):** The MSFD aims to protect more effectively the marine environment across Europe and achieve Good Environmental Status (GES). Several descriptors and associated indicators are related to climate change effects (i.e. D2 Non-indigenous species).
- ▶ **European Green Deal:** The European Green Deal aims to make Europe climate neutral by 2050. To make this objective legally binding, the Commission proposed the European Climate Law, which also sets a new, more ambitious net greenhouse gas emissions reduction target of at least -55% by 2030, compared to 1990 levels.
- ▶ **Integrated Maritime Policy (IMP):** The policy aims to achieve the sustainable use of the oceans and seas by promoting coordinated and ocean-informed actions via ocean literacy awareness raising and improving the coordination of policies affecting the oceans, seas, islands, coastal and outermost regions and maritime sectors by using the topic of marine litter as a vehicle to that end.
- ▶ **The Bologna Charter:** The Bologna Charter is aimed at the strengthening of the role of the Coastal Administrations in the context of European policies and initiatives at the Mediterranean scale – coastal protection, integrated management, adaptation to climate change – the “Charter” also promotes a Macro-Project initiative for the Programming Period 2014-2020, designed for a coherent Mediterranean macro-thematic and multi-sectoral strategy, open also to the South and East Mediterranean coasts.

At EuroMediterranean level:

- ▶ **The UfM Ministerial Declaration on Environment and Climate Change adopted in 2014.** With the 2014 Declaration the 42 UfM countries agreed to take action to advance cooperation and alignment on environment and climate change across the region. The Declaration sat the basis for the transition of the Mediterranean region towards a green and low emissions economy providing real opportunities for preserving natural resources, job creation, improvement of the quality of life for all, meaning an overall sustainable future. The ministerial declaration called for joint action on three interlinked axes of work: depollution; pollution prevention (through sustainable consumption and production as well as resource efficiency); and climate change.
- ▶ **UfM Ministerial Declaration on Environment and Climate Action adopted in 2021.** Within the renewed political commitment to the transition towards green, circular and socially inclusive economy, The Declaration highlights that the protection, restoration and sustainable management of biodiversity and ecosystems and tackling climate change in an integrated manner must be an essential part of immediate action with near and mid-term targets, to be coherent with longer-term strategies for the protection of human health and well-being. Ministers also stressed the importance



of mainstreaming environment and climate action across all sectoral policies, including energy, industry, agriculture, and transport, while mobilizing and scaling up resources to support the green transition. Investments and sustainable finance featured high on the agenda, as well as the need to step up action on adaptation and to reinforce the science-policy nexus.

- ▶ **UfM 2030 GreenerMed Agenda:** 2030GreenerMed is a joint flagship agenda, adopted by the 42 UfM Member Countries, that supports the implementation of the 2nd Ministerial Declaration on Environment and Climate Change. The UfM 2030GreenerMed Agenda provides a regional structured framework that, based on the coordination of existing and future programmes and projects, creates political, operational and financial convergence around the following priority axes of cooperation: support the transition towards a green, circular and socially inclusive economy, based on sustainable consumption and production practices and nature-based solutions; Prevent and reduce pollution on land, air, and sea; as well as protect, preserve, manage, and restore natural resources in the Mediterranean region within an integrated ecosystem approach, including terrestrial, marine, and coastal dimensions. Climate action for mitigation and adaptation is integrated as a cross-cutting theme of high regional priority. This is essential to address environmental degradation and climate change and shape a new future in harmony with nature.

At global level:

- ▶ **The UN Sustainable Development Goals:** The Sustainable Development Goals were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The Sustainable Development Goal 15 of the 2030 Agenda for Sustainable Development is devoted to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”.
- ▶ **The 2021-2030 UN Decade of Ocean Science for Sustainable Development:** The United Nations has proclaimed a Decade of Ocean Science for Sustainable Development (2021-2030) to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean.
- ▶ **The CBD Post-2020 Global Biodiversity Framework:** A post-2020 Global Biodiversity Framework will be adopted at the conference that will take place in Kunming, China, in August 2022.
- ▶ **The Paris Agreement:** The Paris Agreement, under the United Nations Framework Convention on Climate Change, is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.



4. About this document

This document aims to deliver tangible recommendations towards both the improvement of policy design and implementation and administrative management of the Mediterranean MPAs, based on the results, outcomes and lessons learned from the project's activities implemented in 7 pilot Mediterranean MPAs.

The collective experience of the pilot MPAs sets the foundations for a joint participatory approach in Mediterranean MPAs to deal with the rapidly increasing challenge of climate change. This approach, along with its strategic elements, is captured in the present document, which aims to stimulate decision makers at the local, regional and Mediterranean level to put Mediterranean MPAs at the frontline of adaptation and mitigation to climate change.



FIGURE 4-1. Coralligenous habitat in Calanques National Park (Photo © F. Launette).



5. Policy recommendations for fast-tracking climate change actions in Mediterranean MPAs

MPAs are recognised as one of the strongest and most effective tools for protecting marine life and the livelihoods of coastal communities. The long-term, place-based nature of MPAs provides an advantage in addressing the impacts of climate change by providing a focal area for management and science to reduce stressors, to monitor conditions and trends, and engage with the public towards co-deciding mitigation and adaptation measures.

During its entire life cycle, MPA Engage showcased how Mediterranean MPAs could be monitored in a harmonized way in order to assess the climate change impacts, how their vulnerability to climate change could be assessed in a comprehensive manner, how citizens can contribute to the science we need for the future we want, how MPA managers could develop science-based climate change adaptation and mitigation action plans via participatory and bottom-up approaches.

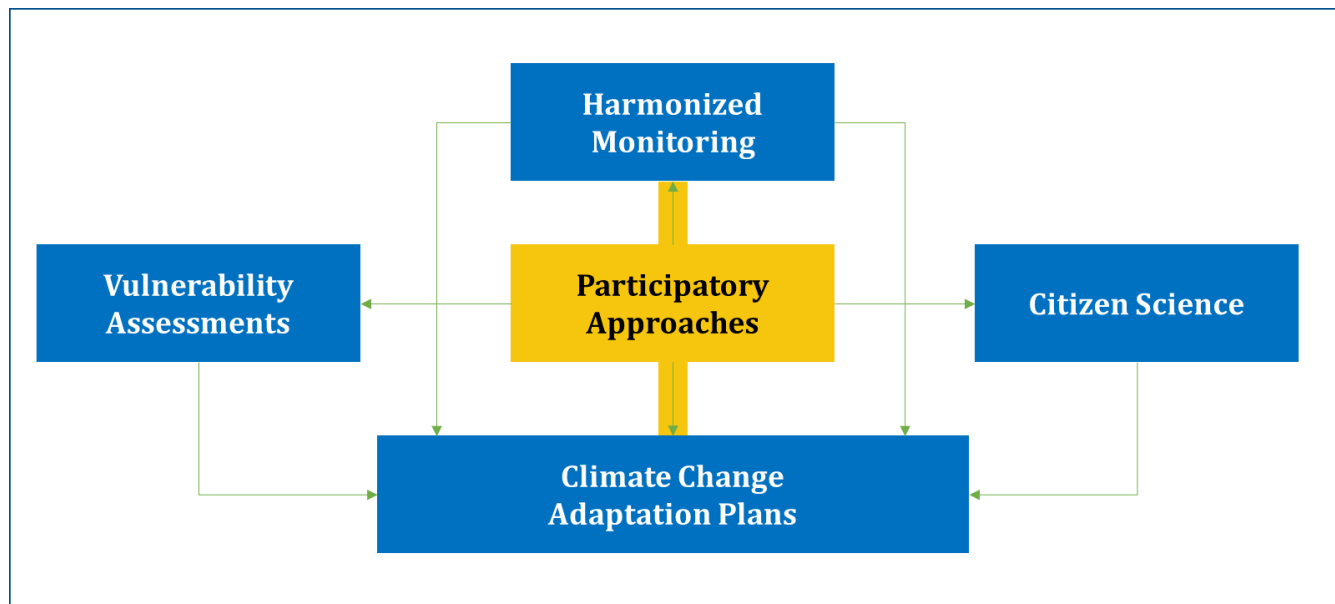


FIGURE 5-1. The components of the MPA Engage 5-fold approach.

The results of the 5-fold MPA Engage approach have generated fundamental recommendations for fast-tracking climate change actions for achieving effective management and enhanced resilience in a changing ocean. These priority actions are depicted below:



RECOMMENDATION #1

Plan and support comprehensive and well-articulated participatory processes through all stages of the adaptive management cycle and build a strong base for community action against climate change in Mediterranean MPAs.

Participatory processes are key enablers of the necessary alliances between stakeholders, generating constructive discussion among communities in relation to climate change. The strengthening of the community fabric around the common interest of embracing MPAs as core tools to tackle climate change will also favor the policy design process, its acceptability and implementation.

To foster these participatory processes, it is recommended to preview and plan a path from simply informing the stakeholders (the minimum in any participatory approach process) to consulting them, to involving them, to collaborating with them and finally to empowering them, which is the highest level of involvement (the final decision-making is placed in stakeholders' hands). The tools or techniques required to accomplish this path go, for example, through communication and awareness raising campaigns, information meetings, focus groups, stakeholder workshops and co-participatory initiatives, where stakeholders take on a task and generate a decision or output that ultimately influences the decision.

The MPA Engage quintuple helix participatory approach – that involved MPA-managers, socio-economic actors, scientists, public authorities and citizens – was applied in all MPA Engage actions including the development of the climate change vulnerability assessments, the monitoring of climate change via citizen science and the elaboration of climate change adaptation and mitigation plans.

All pilot MPAs that operationalized the MPA Engage participatory process plan reported that the overall process was comprehensive, well-articulated and educative, concretely enabling them to put together the different components of the MPA Engage pilot actions, namely the monitoring results, the vulnerability assessments, the citizen science actions, and the actions to elaborate climate change adaptation and mitigation plans. In spite of the challenges that had to be dealt with, the experience strengthened the capacities of all those involved in the participatory processes, generated commitment to promote MPAs as nature-based solutions to tackle climate change, established and/or strengthened alliances among key stakeholders, and emphasized the potential of the participatory process as a powerful tool to generate constructive discussion among communities related to climate change. The MPA Engage showcases demonstrate that supporting the implementation of participatory processes can successfully lead to effective decision-making for climate change adaptation and mitigation in Mediterranean MPAs.

READ MORE AT:

[“Deploying the Quintuple Helix Participatory Approach in Mediterranean MPAs for effective decision-making against Climate Change: showcases & essential elements for success”](#). D.3.6.8, Interreg Med MPA Engage, 2022.



RECOMMENDATION #2

Deploy vulnerability assessments as tailor-made decision support tools for enhanced adaptive management, strengthened dialogue and effective climate change adaptation strategies.

The analysis of the vulnerability of MPAs is fundamental to understand the current and future threats to these areas in view of implementing adaptation strategies. Vulnerability Assessments allow to identify such impacts and enhance the role of MPAs as nature-based solutions to face climate change.

MPA Engage developed a composite indicator-based index to evaluate the socio-ecological vulnerability of Mediterranean MPAs. Vulnerability to climate change refers to the predisposition to be adversely affected by the impacts of climate change, defining how severe the effects can be in a given system. Vulnerability comprises the exposure of the system to the changing climate, along with the degree to which the system could be affected, but it also involves the capacity of the system to reduce that disruption by taking actions that enhance resilience. The methodology developed provides MPA managers with a useful instrument that identifies where potential actions are needed within the MPAs, to preserve and protect the MPAs species and habitats from the impacts of climate change.

To provide a more comprehensive understanding of the vulnerability of Mediterranean MPAs to climate change, the methodology developed should be applied to more MPAs of the basin. The same framework could be adapted to explore vulnerability to other kinds of species, habitat and users. The activity helps to understand the MPA starting point, by acknowledging which data are missing and where it should focus its attention and resources to establish and improve a monitoring system in order to get more data and cover an increased number of indicators.

Lastly, in order to have a real and reliable picture of the environmental scenarios, which are evolving faster than the common legislative processes, it must be possible to repeat vulnerability assessments every 2-3 years to include new data when available and update existing indicators. This could allow, if planned, to be ready to implement adaptation strategies to decrease system vulnerability considering the results provided by the same assessments.

READ MORE AT:

[“Joint Vulnerability Assessment Plans”](#), D.3.3.8, Interreg Med MPA Engage, 2022.



RECOMMENDATION #3

Promote Mediterranean MPAs as sentinel sites to monitor climate change impacts and adopt at Mediterranean level a harmonized and robust monitoring approach that can address the local socio-ecological needs and conditions.

Mediterranean MPAs are considered sentinel sites to monitor climate change impacts on marine ecosystems. A harmonized and robust climate change observation system in the Mediterranean region - as provided by MPA Engage - can generate fit-for-purpose data series and facilitate the collection of crucial information needed for a better understanding of ongoing climate-related changes and better-informed adaptive management.

The monitoring strategy developed and tested in the MPA Engage project allows to track four main categories of climate change impacts: i) changes in physico-chemical conditions, ii) shifts in distribution of both native and alien species, iii) episodic events and iv) changes in phenology. Based on the availability of 11 common protocols, MPAs can select the most appropriate monitoring protocols to develop a tailor-made monitoring strategy fully adapted to their needs and the local socio-ecological conditions.

READ MORE AT:

[“Joint Monitoring Plan in the MPAs”](#), D.3.4.8, Interreg Med MPA Engage, 2022.

RECOMMENDATION #4

Invest in and promote citizen science and community-based research and monitoring on climate change in Mediterranean MPAs via developing an enabling policy environment for open science.

Environmental agencies have nowadays massive data requirements; national research funds are drying up while emerging technologies are constantly advancing. These three factors are driving participatory science to boom around the world. Among the different disciplines of participatory science, environmental science attracts the majority of initiatives and the most dedicated volunteers. Participatory and citizen science is a method of undertaking scientific research whereby community groups and science professionals work together in a meaningful way on locally-relevant scientific research projects. Participants/volunteers gain new skills and a deeper understanding of the scientific work at hand during the activity.

The benefits that citizen and participatory science activities can deliver include cost-effective collection of long-term data with large geographical coverage, increased public awareness on climate change issues and



enhanced participation in all phases of climate change adaptive management strategies towards effective and resilient Mediterranean MPAs.

MPA Engage offered the first effective opportunity to develop a strong Mediterranean network of marine citizen scientists committed to climate change monitoring. It has successfully delivered a catalogue of protocols suitable for community-based data collection, a tool to engage diving centres in the application of monitoring protocols, a showcase of a network of scientists highly motivated in the scientific valorisation of citizen science data on climate change.

READ MORE AT:

["Joint Plan on Citizen Science"](#), D.3.5.8, *Interreg Med MPA Engage, 2022.*

RECOMMENDATION #5

Enhance the resilience and effectiveness of Mediterranean MPAs through the elaboration of science-based climate change adaptation and mitigation action plans tailor-made to the MPAs specific context.

There is an overwhelming scientific consensus that supporting marine conservation under climate change is one of the grand challenges for the coming decade. The Mediterranean MPAs face an urgent need to pursue evidence-based solutions to the biodiversity decline and the unprecedented pressures from climate change in the region. There is, therefore, an imperativeness to mitigate these risks and to consider adaptation options in partnership with local communities, decision-makers, civil society organizations, research bodies, and other socio-economic actors at local, national and regional level.

Within the framework of the MPA Engage project, a participatory decision-making process was run by the 7 pilot Mediterranean MPAs with the aim to identify and adopt priority climate change adaptation measures. The measures adopted and/or shortlisted by the pilot MPAs, differ in levels of sophistication, in levels of detail or in levels of comprehensiveness, depending also on the natural, political, organizational and institutional context of the MPAs. However, these have been processed and a set of 10 common no-regret priority measures have been identified that should be jointly adopted by Mediterranean MPAs in response to the lurking effects of climate change. These measures can be adapted to address the specific context of each Mediterranean MPA appropriately, so that they can ensure that MPAs will render their full range of values, functions and services to people and nature, including protection against climate-related factors and lower risks from natural disasters.

READ MORE AT:

["Joint Plan for Climate Change Adaptation in Mediterranean MPAs"](#), D.3.7.8, *Interreg Med MPA Engage, 2022.*

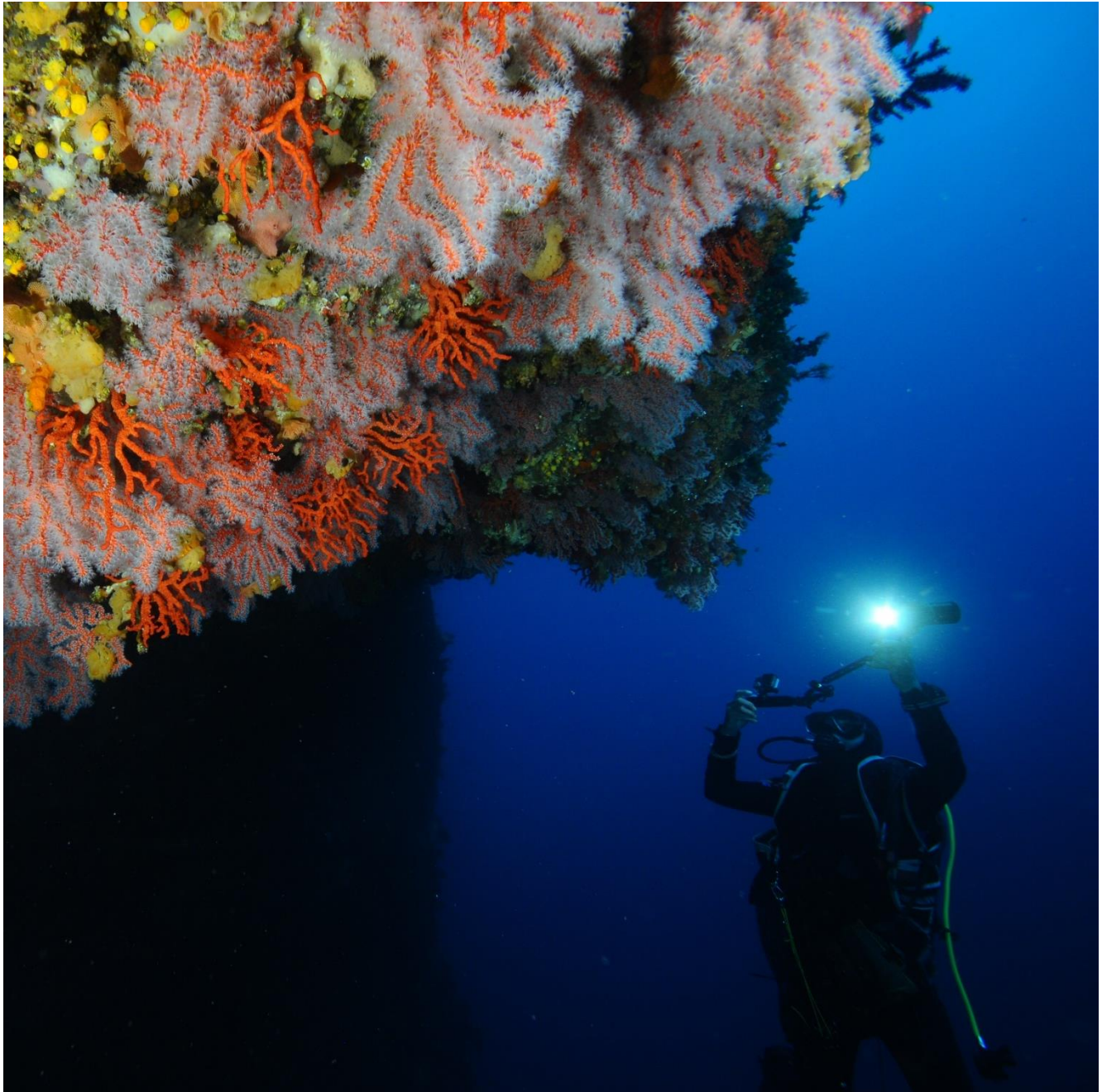


FIGURE 5-2. Monitoring climate change impacts (Photo © J. Garrabou).



6. Turning the MPA Engage recommendations in action

6.1. THE MPA ENGAGE POLICY RECOMMENDATIONS & THE POLICY CONTEXT

The main policy and legislative instruments in place at European, Mediterranean and EuroMediterranean level are presented in the Table 6-1 and have been linked with the MPA Engage thematic policy recommendations of relevance. Obviously, instrumental to turning the thematic policy recommendations in action, horizontal actions are required to create the enabling conditions and catalytic momentum. These horizontal actions may indicatively include:

- ▶ Awareness raising and education for sustainable development campaigns on the climate change effects targeting local stakeholders, such as artisanal and recreational fishermen, divers, boaters and others.
- ▶ Awareness raising activities targeting MPA visitors on climate change effects and best practice approaches and responses at MPA level.
- ▶ Sector-specific capacity building to reduce and manage the impact of coastal and marine users' activities on MPAs and enhance ocean literacy towards ocean-informed actions and the adoption of good practices.
- ▶ Networking and community-building actions among and between Mediterranean MPAs and all stakeholders of the maritime sector.



FIGURE 6-1. One of the most emblematic Mediterranean species, the red coral *Corallium rubrum*, suffering from overfishing and mass mortalities linked to climate change (Photo © J. Garrabou).



TABLE 6-1. Linking the MPA Engage policy recommendations to the related policy and legislative instruments at Mediterranean, European and EuroMediterranean level.

	Recommendations				
	1	2	3	4	5
At Mediterranean level					
Mediterranean Strategy for Sustainable Development					
Regional Climate Change Adaptation Framework for Marine and Coastal Areas					
Integrated Coastal Zone Management					
The Ecosystem Approach & IMAP					
At European level					
Habitats and Birds Directives					
Biodiversity Strategy for 2030					
Marine Strategy Framework Directive					
European Green Deal					
Integrated Maritime Policy					
The Bologna Charter					
At EuroMediterranean level					
2014 UfM Ministerial Declaration on Environment and Climate Change					
2021 UfM Ministerial Declaration on Environment and Climate Change					
UfM 2030 GreenerMed Agenda					



6.2. THE MPA ENGAGE OPERATIONAL GUIDE & TOOLBOX

The adoption of common tools, protocols and plans is expected to enhance the management effectiveness of Mediterranean MPAs and promote their role as nature-based solutions to face climate change. The outcomes of MPA Engage offer a first real opportunity to develop a solid Mediterranean network of diverse communities and actors (citizens, scientists, practitioners and entrepreneurs in the maritime sector) engaged in the conservation of marine and maritime natural heritage via supporting climate change adaptation and mitigation strategies.

In order to facilitate the uptake and operationalization of the MPA Engage policy recommendations on the ground, an operational guide has been developed; the guide seeks to assist MPA managers and practitioners in the region to put Mediterranean MPAs at the frontline of adaptation and mitigation to climate change. The guide provides an overview of the strategic elements of the MPA Engage approach, which are organized in five main lines of action in accordance with the policy recommendations and feature the overall methodological approach, the main tools and resources produced, the main lessons learned and recommendations, and the indicative involved costs. The MPA Engage partners aspire that the operational guide will serve as an effective tool towards building a Mediterranean network of MPAs resilient to climate change. The table below features the list of tools and resources that are included in the MPA Engage toolbox (it can be accessed [here](#))



FIGURE 6-2. Mortality of red gorgonian *Paramuricea clavata* (Photo © J. Garrabou).



TABLE 6-2. List of tools and resources featured in the MPA Engage toolbox per recommendation and topic addressed.

Rec. No	Topic	Toolbox
#1	Participatory approaches	<ul style="list-style-type: none"> ▶ The MPA Engage Guidelines for applying a Quintuple Helix Participatory Approach ▶ The MPA Engage Synthesis on Deploying the Quintuple Helix Participatory Approach in Mediterranean MPAs for effective decision-making against Climate Change: showcases & essential elements for success ▶ The MPA Engage Quintuple Helix Participatory Approach Reports in the 7 pilot MPAs ▶ The MPA Engage e-Learning Materials
#2	Vulnerability assessments	<ul style="list-style-type: none"> ▶ The MPA Engage Vulnerability Assessment Guidelines ▶ The MPA Engage Joint Vulnerability Assessment Plans ▶ The MPA Engage Vulnerability Assessment Reports of the 7 pilot MPAs ▶ The MPA Engage e-learning materials
#3	Harmonized monitoring	<ul style="list-style-type: none"> ▶ The MPA Engage Monitoring Protocols Toolkit ▶ The MPA Engage Joint Monitoring Plan in the MPAs ▶ The MPA Engage e-Learning Materials ▶ The MPA Engage three monitoring protocols for citizen science activities
#4	Citizen science	<ul style="list-style-type: none"> ▶ The MPA Engage Joint Plan on Citizen Science ▶ Basic Research Operator - Methodology and Working Plan ▶ The MPA Engage Citizen Science e-Learning Materials
#5	Action plans	<ul style="list-style-type: none"> ▶ The MPA Engage Guidelines on how to Develop a Local Climate Change Adaptation and Mitigation Plan ▶ The MPA Engage Joint Plan for Climate Change Adaptation in Mediterranean MPAs ▶ The MPA Engage Climate Change Adaptation Plans of the 7 pilot MPAs ▶ The MPA Engage e-Learning Materials



7. In conclusion

The operationalization of the MPA Engage policy recommendations obviously poses challenges for the management bodies of Mediterranean MPAs and public authorities, in terms of requiring new competences and skills, human and financial resources. However, these provide effective guidance and orientation towards no-regret climate change adaptation actions. These actions should be adapted to address the specific context of each Mediterranean MPA appropriately, so that they can ensure that MPAs will render their full range of values, functions and services to people and nature, including protection against climate-related factors and lower risks from natural disasters.

RECOMMENDATION #1

Plan and support comprehensive and well-articulated participatory processes through all stages of the adaptive management cycle and build a strong base for community action against climate change in Mediterranean MPAs.

RECOMMENDATION #2

Deploy tailor-made decision support tools such as vulnerability assessments for enhanced adaptive management, strengthened dialogue and effective climate change adaptation strategies.

RECOMMENDATION #3

Promote Mediterranean MPAs as sentinel sites to monitor climate change impacts and adopt at Mediterranean level a harmonized and robust monitoring approach that can address the local socio-ecological needs and conditions.

RECOMMENDATION #4

Invest in and promote citizen science and community-based research and monitoring on climate change in Mediterranean MPAs via developing an enabling policy environment for open science.

RECOMMENDATION #5

Enhance the resilience and effectiveness of Mediterranean MPAs through the elaboration of science-based climate change adaptation and mitigation action plans tailor-made to the MPAs specific context.

FIGURE 7-1. Overview of the MPA Engage policy recommendations.



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