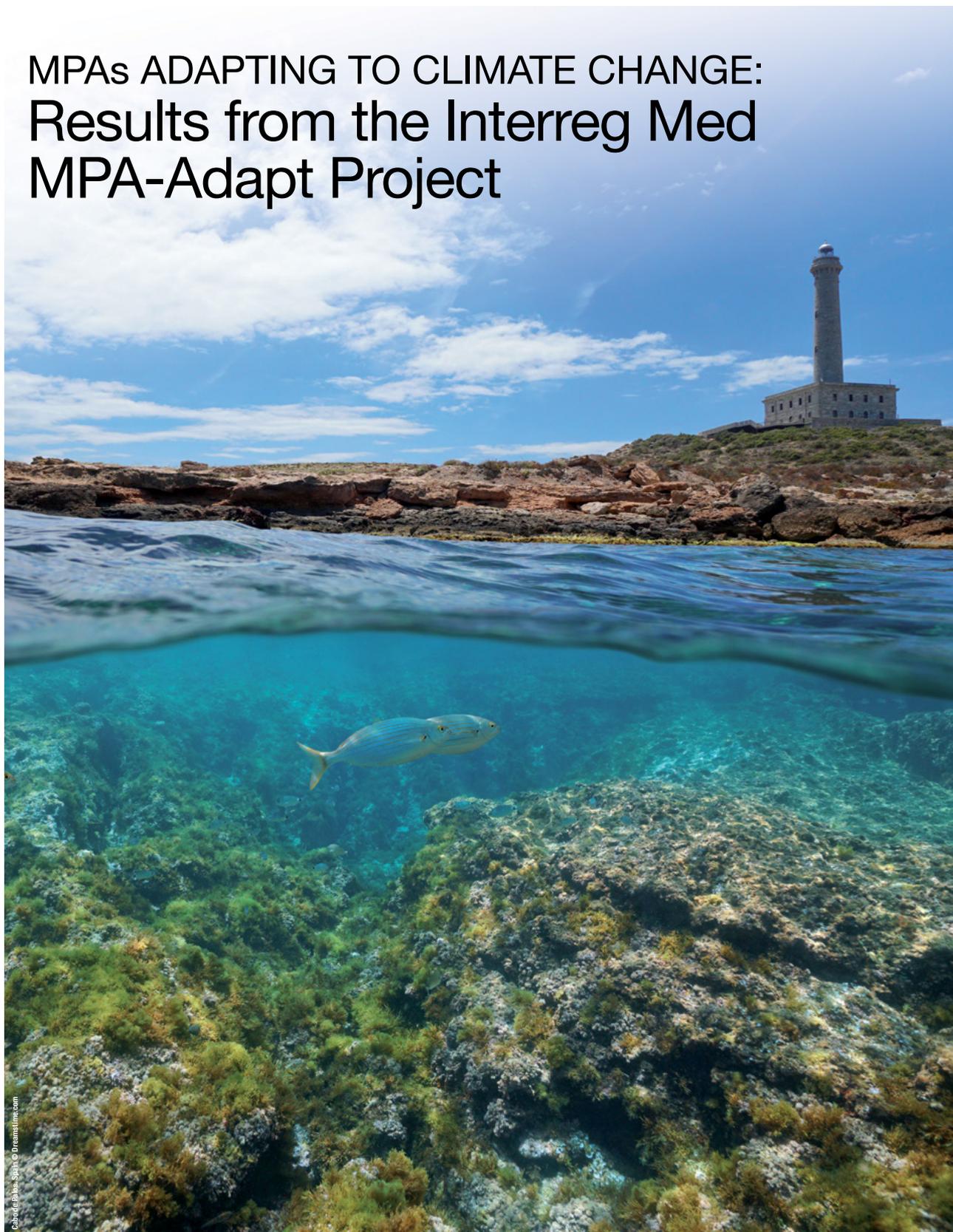


MPAs ADAPTING TO CLIMATE CHANGE: Results from the Interreg Med MPA-Adapt Project



Our Story: Why and How

Mediterranean Marine Protected Areas (MPAs) are starting to witness climate change and the resulting impacts caused by it. Adaptation mechanisms and actions are strongly needed to reduce the number and intensity of threats exacerbated by this phenomenon, particularly in the areas and activities of projected high risk. Incorporating adaptation measures into the management plans/actions in and surrounding MPAs can increase the resilience of marine communities and the coastal human societies that depend on them.

The EU Interreg Med project MPA-Adapt "*Guiding Mediterranean MPAs through the climate change era: Building resilience and adaptation*", has aimed to develop collaborative

and site-specific adaptation plans for MPAs to enhance resilience to the effects of climate change.

Five MPAs, **Port Cros National Park, Portofino MPA, Bonifacio Nature Reserve, Isole Pelagie MPA and Brijuni National Park**, were the pilot MPAs for developing these Adaptation Plans to Climate Change.

Work is developed in a **four-stage process**, to provide insights that can be used to inform and revise the MPA management plan through an ongoing iterative process involving a structured surveillance and monitoring programme. The overall process is outlined in Figure 1, which is a simplified version of international best practices.

Capacity building training on Adaptation to climate change. Bonifacio, 2018



Process to build adaptation plans in Marine Protected Areas

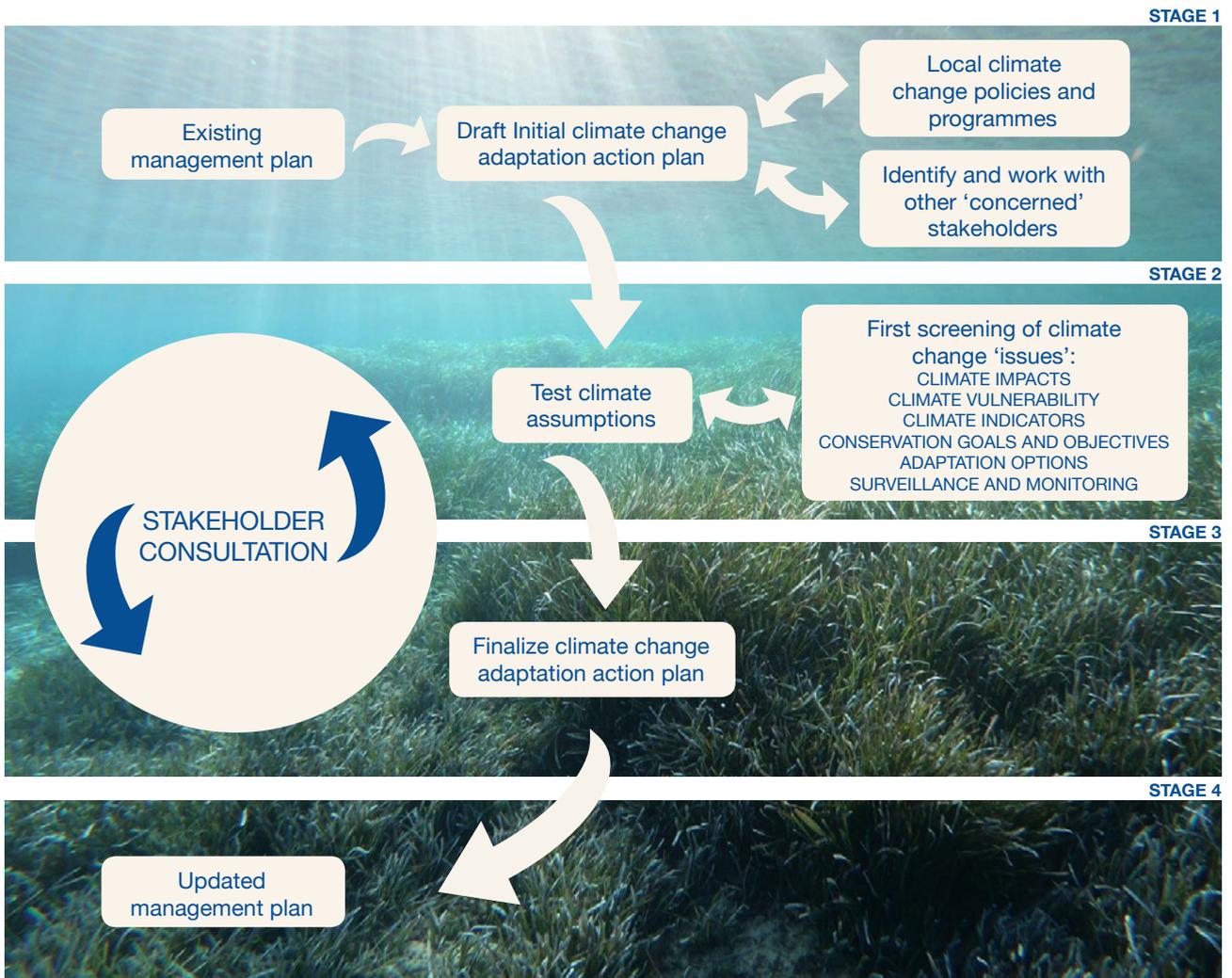


Figure 1. Process towards a MPA climate change adaptation action plans adopted in MPA-Adapt project (IUCN MPA Adaptation Workshop, 2018)

Stage 1.

The purpose of this first stage is to reflect on the existing management plan, by examining the current level of knowledge on climate change-related issues in the MPA, and gaining a broader perspective on local climate change policies and programmes, which allows to develop an initial idea of what the action plan should look like and include. A key aspect of this stage should be to identify those partner stakeholders who are in some way related to climate change impacts affecting the MPA and adjacent areas.

Stage 2.

This is an analytical and participatory stage based on a consultation where the first screening of climate change issues is explored and tested to define necessary changes in the structure content and application of the original management plan. This may involve iterating the adaptation plan with stakeholders to progressively include details that reflect the MPA's understanding of climate change issues.

Stage 3.

This stage synthesizes the information from stages 1 and 2 in one final action plan for the MPA's climate change adaptation, based on discussions about climate change impacts and adaptation actions with adjacent PAs or surroundings. Such approach may allow to economise efforts for tackling common climate change issues across the sites as a part of the identified adaptation actions.

Stage 4.

This stage is about refining the management plan in light of the climate change adaptation action plan.

Building capacity for effective management in the MPAs

The objective of these trainings was to provide guidance to MPA managers on adaptation management in response to climate change impacts on marine and coastal environments, based on best-practice examples that could be applied at local level within the Mediterranean region.

Training sessions were given to Mediterranean MPA managers, MPA staff involved in management activities and local administrations on:

- **Developing action plans** for MPA climate change adaptation,
- **Conducting and communicating** vulnerability assessments of habitats, species and socio-economic aspects,
- **Monitoring Protocols** for climate change: Temperature surveys and Fish census; Mass mortalities; Local Ecological Knowledge.

The theory and practical modules combined exercises allowed participants to explore in detail the needs, obstacles and logic behind different methodologies.

Discussions allowed to obtain more information about remaining challenges, for assessing risks and exploring potential actions and priorities needed to ensure the adaptability and resilience of biodiversity and local communities.

Associated partners from MPAs in Croatia (Mjet, Telascica), Spain (Marine Fisheries Reserves), Greece (Axios Delta), Italy (Tavolara) and Malta (Malta Protected Area ERA) also attended these trainings.

Training on monitoring protocols in Lampedusa, 2018



Monitoring climate change and its impacts



The knowledge of experienced fishers to understand the changes

Documenting climate change impacts is a key task to support Integrated Coastal Zone Management (ICZM) and to inform maritime spatial planning (MSP). The series of standard protocols, developed during the MPA-Adapt project and the specific ones developed at some of the MPAs, provides a practical guidance to track climate-related impacts in MPAs and beyond. The guiding principles and architecture of these tools respond to the requirements of the Ecosystem Approach undertaken under the auspices of UNEP/MAP Barcelona Convention, with the ultimate objective of achieving the Good Environmental Status (GES) of the Mediterranean Sea and Coasts.

Technically, these tools are inspired by the categories defined to track climate change in the Mediterranean MPAs¹. Indicators have been chosen based on their scientific relevance, feasibility and cost-effectiveness. The engagement of local stakeholders

(e.g. diving clubs and fishers) is another key ingredient for the long term application of these methodologies.

Adopting these protocols, allows participants to join a common and consolidated strategy to track climate change effects. This will improve, complement or extend the ongoing monitoring initiatives in the different Mediterranean countries and is key information for supporting mitigation strategies and effective adaptation plans.

Protocol 1: Monitoring sea surface temperature conditions

The proposed method has been designed to acquire long-term and high-resolution information on temperature conditions along the depth gradient in coastal waters based on the previous work developed by TMedNet (www.t-mednet.org/). In the long term, these data series will build a robust baseline and

track hydrological changes (e.g. warming, heat waves, shifts in seasonality, stratification) to better understand the impacts of climate warming on marine coastal biodiversity.

Protocol 2: Assessment and monitoring of mass mortality events on benthic species

The proposed protocol stems from the scientific and field experience gathered during the impact assessment of mass mortality events in different areas of the North-Western Mediterranean. The protocol focuses mostly on some gorgonian species dwelling in shallow waters (0-50 m) of North-Western Mediterranean. However, it can be adapted to assess the impact on other macro benthic species (e.g. sponges, corals, bryozoans). The protocol aims to set the conservation status of surveyed populations, while gathering baseline information to assess the impacts of mass mortality events when they occur.

1. Otero, M., Garrabou, J., Vargas, M. 2013. Mediterranean Marine Protected Areas and climate change: A guide to regional monitoring and adaptation opportunities. Malaga, Spain: IUCN. 52 pages.



Assessing mortality of benthic species

**Protocol 3:
LEK-1 (Exploring Local
Ecological Knowledge to
reconstruct historical changes)**

Local Ecological Knowledge is the information that people have about the ecosystems where they spend most of their time and during their daily activities, like fishing. The following protocol can be used to interview experienced fishers or other sea users, to reconstruct historical changes in species abundances and distribution in their area. It can also be used for the early detection of new species. The same questionnaire can be used to track historical trends for species that changed the most in their abundances: new, increasing, severely declining and disappearing species.

**Protocol 4:
LEK-2 (Exploring Local
Ecological Knowledge for
periodical monitoring)**

The following protocol can be used to interview experienced fishers or other sea users, to regularly (every 12 months) monitor climate-sensitive species of both native and exotic origin.

**Protocol 5:
Fish visual census of climate
change indicators**

It is suggested to track the abundance of target fish species on a regular basis and carry out an underwater visual census survey. The target fish species used as indicators are 9: *Epinephelus marginatus*, *Coris julis*, *Thalassoma pavo*, *Sparisoma cretense*, *Serranus*

scriba, *Serranus cabrilla*, *Sarpa salpa*, *Siganus luridus*, *Fistularia commersonii*.

Digital training videos were also developed in order to highlight effective measures for improving the integration of research and monitoring outputs into conservation projects as well as the identification of unsolved problems and further research needs.

Workshop with fishermen in Isole Pelagie MPA



Communicating climate change and building stakeholder engagement

Communication is a key tool to enhance the understanding of local communities and visitors on the impacts of climate change and the potential adaptation approaches that could be developed at the local sites. They also convey scientific data and local knowledge on climate change and notably on the MPAs' mitigation and adaptation role to different groups of stakeholders.

MPA-Adapt has produced a rich palette of communication materials: exhibition, posters, leaflets,

information PVC boards, cards & videos. Likewise, the project partners have been involved in different activities to present MPA-Adapt activities and final goals, including meetings, festivals, capacity buildings targeting a large diversity of stakeholders.

In order to enable better understanding, increase engagement and motivate behavioral changes, the project has also fostered networks by improving the dialogue and coordination among the MPA communities, which include

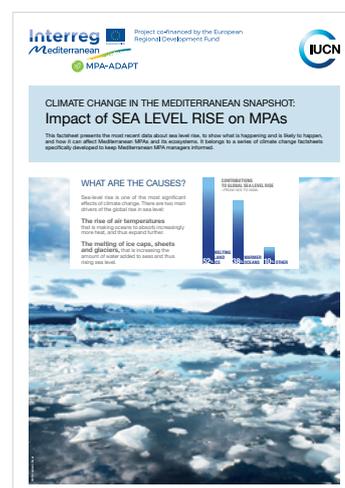


▲ Climate change exhibition in Brijuni National Park / Example of factsheet ▼

MPA managers, local communities, marine scientists, regional and national Institutions.

MPA project partners engaged locally in organising “Climate Change awareness-raising” events. These events aimed to raise awareness on climate change effects and the role of local MPAs as efficient tools in reducing the effects of warming in the functioning of ecological and socio-economic communities.

Best practices and key success factors have been described in factsheets, infographics and posters, as well as reports and news stories feeding the project partners' social media networks and webpages. A series of [factsheets](#) on climate change in MPAs, notably on air and sea surface temperature, sea level rise and ocean acidification, have also been developed with [several project micro-videos](#).



Developing collaborative and site-specific adaptation plans for the MPAs to enhance resilience to climate change impacts

The testing phase of the project aimed to provide participant MPAs with the tools and knowledge needed to:

- **Assessing vulnerability** of biodiversity and socio-economic activities;
- **Building a management plan** that included strategies to adapt and monitor climate change in MPAs;
- **Improving our knowledge** of climate change impacts on Mediterranean MPAs

The MPAs helped specific sectors and stakeholders develop their capacities and used a variety of techniques to conduct monitoring, vulnerability assessment of biodiversity and their socio-economic activities. Through stakeholder consultations with different groups (including other administrations, scientists, fishers, tourist representatives, diving companies) they revised the results of these vulnerability assessments and monitoring programmes and discussed potential adaptation actions.

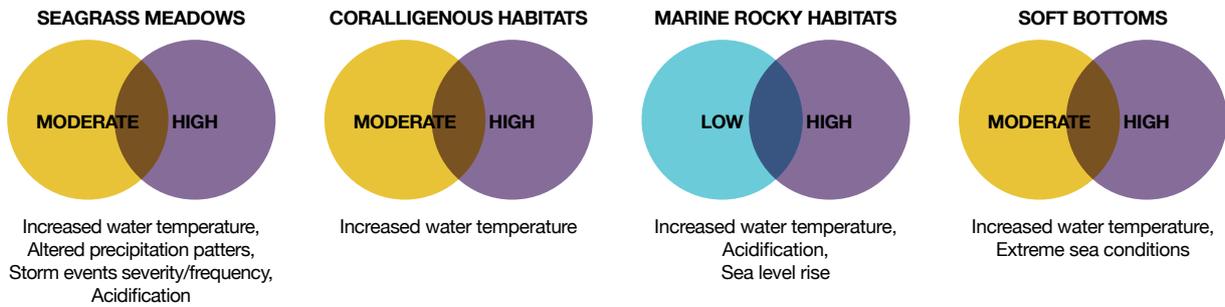
As climate stressors, most MPAs referred during their vulnerability assessments to the already detected changes and variations in air and sea water temperature, extreme weather events, coastal erosion and sea level rise among others. Vulnerability assessments for biodiversity were mostly focused on 4 coastal habitats (Table 1) and showed how some of them had already a moderate to high vulnerability to climate change.

All MPAs focused on two main economic activities: artisanal fisheries and tourism in their different forms (e.g. diving, beach tourism, recreational boating, visitors, etc.). These activities were conducted within the borders of the MPAs and were regulated. Generally speaking, artisanal fishing had the highest vulnerability level in most MPAs (going from moderate to high), while tourism had a moderate vulnerability and in some cases it was found that climate change might have positive impacts on this activity (e.g. prolonged summer season).

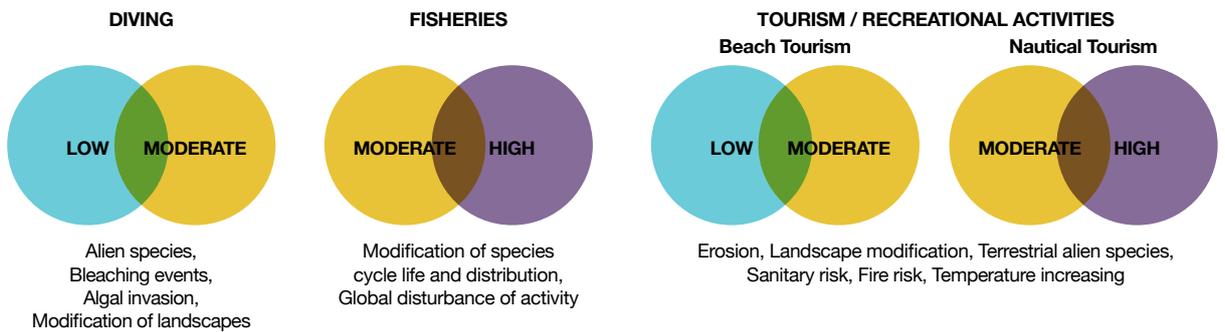
Monitoring changes in marine communities



**MAIN RESULTS OF THE BIODIVERSITY VULNERABILITY ASSESSMENTS
CARRIED OUT BY THE PARTICIPATING MPAs AND MAIN CLIMATE STRESSORS**



**MAIN RESULTS OF THE VULNERABILITY ASSESSMENTS
OF CLIMATE SENSITIVE ECONOMIC ACTIVITIES AT THE MPAs**



The Vulnerability Assessment exercise allowed participating MPAs to produce a document serving as a baseline assessment that will need to be improved and updated with new data and increased stakeholder and local expert participation.

Overall more than 30 main measures were proposed as means of adaptation for building resilience to climate change of key marine habitats and for coastal human activities in

the participating MPAs. These adaptation measures aimed to reduce the vulnerability by increasing adapting capacity or reducing exposure and the consequences of the effects caused by climate change.

These actions do not encompass the full list of possibilities that could be implemented to reduce vulnerability in each MPA but rather the ideas generated with the stakeholder consultation to identify potential actions that

could be undertaken in the near future by the management authorities and the stakeholders to prioritize when addressing climate change.

Adaptation regulatory and non-regulatory measures, will have to progressively advance and be adopted by the MPAs continuously and as part of a management effectiveness programme.

Proposed adaptation strategies by the 5 MPAs (Bonifacio, Brijuni, Isole Pelagie, Port Cros and Portofino)

VULNERABILITY AREA	DOMAIN	STRATEGY	ACTION MEASURE
Diving	Research and monitoring	Increase adaptive capacity	Mobilize divers in science participatory programs in order to have an idea of changes in real time
	Protection	Reduce consequence (sensitivity)	Develop eradication campaigns with divers for particular invasive algae species e.g. <i>Caulerpa taxifolia</i> .
	Regulation	Reduce consequence (sensitivity)	Close/change diving paths in damaged sites with coralligenous or limit the presence of divers in affected sites
	Awareness	Increase adaptive capacity	Sensitize divers about the effects of climate change on marine ecosystems.
Coastal tourism	Research and monitoring	Adaptive capacity	Evaluate the impact of tourist frequentation and disturbance (e.g. trampling) on sensitive species
	Protection	Reduce consequence (sensitivity)	Prevent fire risks by reinforcing surveillance, updating the fire programme and evacuation measures
	Technology	Increase adaptive capacity	Optimize water consumption and improve availability
	Awareness	Increase adaptive capacity	Develop communication activities to visitors on the current knowledge on climate change and its impacts, also providing information of the actions undertaken by the MPA
		Increase adaptive capacity and likelihood (exposure)	Build educational programmes on carbon footprint
Artisanal and recreational fisheries	Research and monitoring	Increase adaptive capacity	Increase the citizen science activity with fishermen engagement (professionals and recreational)
			Evaluate the fishing of cold water affinity species for future adaptation measures
			Increase specific research programmes orientated to understand and fill the information gaps for key species target by artisanal fisher's sector
	Regulation	Reduce livelihood (exposure) and consequence (sensitivity)	Limit or ban the use of disposable plastic by fishers
			Apply restrictions on artisanal and recreational fishing in order to avoid or decrease damages on coralligenous habitat and loss of nets
	Economy	Increase adaptive capacity	Enhance commercialization of non-native species
	Governance	Increase adaptive capacity	Reinforce the partnership with the fisheries associations to establish an adaptive management to resource use
	Awareness	Increase adaptive capacity and reduce likelihood	Increase educational activities in order to make environmental consciousness in the population also promoting good practices

VULNERABILITY AREA	DOMAIN	STRATEGY	ACTION MEASURE
Posidonia habitat	Research and monitoring	Increase adaptive capacity	Monitor the status of Posidonia meadows, depth limit and flower events
	Protection	Increase adaptive capacity	Made restoration activities of protected/rare species
		Reduce likelihood (exposure)	Preserve coastal forest to avoid erosion
	Regulation	Reduce consequence (sensitivity)	Reinforce the implementation of existing regulations on anchoring and/or forbid anchoring activities on Posidonia meadows to reduce seagrass fragmentation.
Coralligenous habitat and communities	Research and monitoring	Increase adaptive capacity	Monitor the status of coralligenous communities and impacts
	Technology	Increase adaptive capacity	Develop restoration activities of protected/rare species
Rocky, soft and other infralittoral habitats	Research and monitoring	Increase adaptive capacity	Establish a monitoring programme for <i>Lithophyllum byssoides</i> to sea level rise
	Protection	Increase adaptive capacity	Develop restoration activities of protected/rare species
	Technology	Reduce likelihood (exposure)	Identify the locations that are critical for coastal habitat expansion and that have roads or infrastructure that impede migration and redesign them.
Cross sectoral actions	Research and monitoring	Increase adaptive capacity	Deploy salinity and pH sensors on the MPA territory; set up weather stations and developing terrestrial monitoring protocols, especially on specific parameters such as drought
			Establish a baseline and continuous monitoring of beaches and cliffs to prepare future adaptation measures
	Technology	Increase adaptive capacity	Develop pilot actions for reducing energy consumption and increase use of renewable energy
	Governance	Increase adaptive capacity	Upgrade the existing health management plan of the park with other organisations
	Awareness	Increase adaptive capacity	Continue developing the climate education activities

Overall, these actions are helping to increase the perception on the key role of MPAs providing nature based solutions to adapt to climate change impacts.



Capacity building training on Adaptation to climate change. Bonifacio, 2018

Interreg
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