Interreg Mediterranean
EUROPEAN UNION
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MPA-ADAPT
IUCN

CLIMATE CHANGE IN THE MEDITERRANEAN SNAPSHOT:

Impact of SEA LEVEL RISE on MPAs

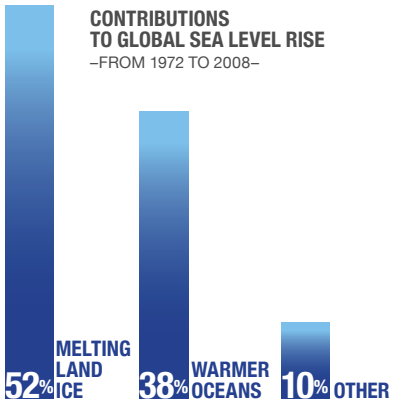
This factsheet presents the most recent data about sea level rise, to show what is happening and is likely to happen, and how it can affect Mediterranean MPAs and its ecosystems. It belongs to a series of climate change factsheets specifically developed to keep Mediterranean MPA managers informed.

WHAT ARE THE CAUSES?

Sea-level rise is one of the most significant effects of climate change. There are two main drivers of the global rise in sea level:

The rise of air temperatures that is making oceans to absorb increasingly more heat, and thus expand further.

The melting of ice caps, sheets and glaciers, that is increasing the amount of water added to seas and thus rising sea level.



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WHAT ARE THE CURRENT OBSERVATIONS AND PROJECTIONS BOTH GLOBALLY AND FOR THE MEDITERRANEAN?

Global mean sea level[1] in 2016 was the highest since measurements started in the late 19th century. Between 1993 and 2015, global sea level increased by 0.66 cm, but in some areas of the Eastern Mediterranean it was as high as 0.88 cm.[2]

According to IPCC 5th Assessment report, future predictions on global sea level project a rise to occur at an alarming rate over the next 80 years.

The report predict that the rise[3] in sea level is likely to reach values of 0.28-0.61 m for a low-emission scenario and 0.52-0.98 cm for a high-emission scenario (for 2081-2100 compared to 1986-2005 period). Predictions of future rise of global sea level are nonetheless subject to several uncertainties.

Overall, IPCC projections predict a future acceleration of sea level rise close to 70% of the global coastlines will experience a relative sea level change close to this global average.

Moreover, the potential collapse of ice shelves could lead to a larger rise than predicted so far.

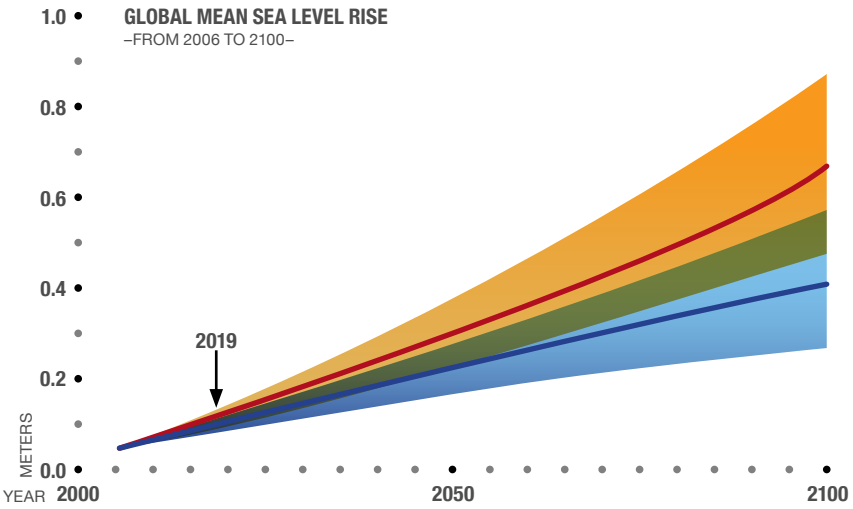
Mediterranean sea-level change may be different from the global average due to the combined effects of water and land movements (including changes in river runoff and the influence of hydrographic variations of Near Atlantic Waters) in different geographical locations.

There is very high confidence that sea levels will continue to rise throughout the Mediterranean, and so is the frequency and height of extreme sea-level events, also due to storms.

What is more uncertain, is the degree of increase at different Mediterranean regions as evaluating the magnitude of the combined effects at local sites is more complex and current models are projecting the expected value or the likely range of probabilities.

Furthermore, the rise in mean sea level could affect more some particularly low-land regions, such as the north Adriatic Sea, the north Aegean Sea and the Gulf of Gabes, where tidal amplitudes can reach up to 1m during spring tides.

PROJECTED CHANGES IN GLOBAL SEA LEVEL



This figure shows global mean sea level rise from 2006 to 2100 as determined by multi-model simulations (IPCC Fifth Assessment Report (AR5). All changes are relative to 1986–2005.

Time series of projections and a measure of uncertainty (shading) are shown for scenarios RCP2.6 (blue; lowest emission pathway) and RCP8.5 (orange; highest emission pathway).

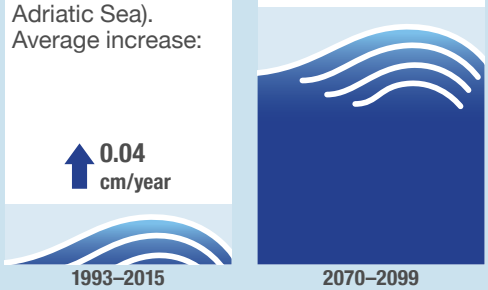
MEDITERRANEAN:

Present observations: Rate over 0.88 cm (0.04 cm/year) between 1993 and 2015 in some areas of the Eastern Med (Aegean Sea, South-Eastern Mediterranean, Adriatic Sea). Average increase:

0.04 cm/year

Projected prediction for the Future: 0,34-0,49 m (for 2070-2099, ref. 1961-1990), (1,17-1,68 cm/year). Average increase:

1.17-1.68 cm/year



1 The mean sea level averaged over the global oceans is called global mean sea level.
2 Calculated from satellite altimeter data together with tide gauge data.
3 In each IPPC assessments is used different climate models and scenarios for greenhouse gas (GHG) emissions.

HOW IS SEA LEVEL RISE INFLUENCING MPA COASTAL HABITATS?

COASTAL WETLANDS

As a consequence of sea level rise, some coastal wetland areas will almost certainly be flooded and transformed into marine or brackish lagoon ecosystems.

The zonification of wetlands will likely transform and/or retreat inland. Certain marsh and wetland species are projected to decline in abundance under these scenarios while others might migrate upslope.

LAGOONS & ESTUARIES

These habitats will be particularly vulnerable to the intensification of storm events. This together with an increase of water temperatures, could favorise higher inputs of nitrogen from activities such as agriculture as well as lead to an excess of nutrients and minerals (i.e. water eutrophication), lack of oxygen and blooms of toxic phytoplankton in lakes and estuaries.

Sea level rise is expected make deltaic or delta-dependent habitats to profoundly change or disappear from now until 2100. Seawater will intrude into deltaic channels, pushing brackish habitats to migrate upstream and inland at the expense of freshwater habitats.

SEA CAVES

The rise of sea levels is likely to affect some sea caves, making them uninhabitable and also potentially affecting the amount of light that penetrates the caves, with consequences for its specific fauna as immobile species of the submerged area that depend on light.

BEACHES & SAND DUNE

These habitats respond to rising seas (and increased storms) by accumulating sand behind the dunes and moving upslope. Beaches that have not enough room to migrate because constructions or roads behind for example, will likely erode or disappear. This can have potential consequences on species of marine turtles, birds, reptiles and others that nest and/or inhabit costal dunes vegetation and beaches.

GROUNDWATER AND COASTAL INFRASTRUCTURE

In MPAs where coastal communities and villages depend on coastal freshwater sources, it is possible that sea level rise contributes to saltwater contamination of groundwater reservoirs. This would increase notably the costs of water treatment or, eventually, will force coastal communities to use alternative freshwater sources located further inland.

Sea level rise will soon have also severe effects also on anthropic infrastructure, such as harbors and tourist installations, cultural heritage sites, etc.

INTERTIDAL HABITAT

Water-level changes and wave erosion can strongly affect the bioconstructions on rocky coasts: rims and reefs built by encrusting coralline algae and worms will almost certainly be affected and damaged. Along with other climate change effects, such as the increase in the acidity of sea water, these changes can have major effects on the growth of these **organisms and could** result in eventually lost in some areas.

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VALUE OF MPAs:
HOW DO THEY CONTRIBUTE TO ADAPT TO SEA LEVEL RISE INDUCED CHANGES AND MITIGATE THE RISKS?

Marine Protected Areas are key in helping coastal ecosystems adapt to sea level rise, since they form a natural protective buffer. Developing appropriate management measures to enhance **this potential should be prioritized as a Nature Based Solution for coastal adaptation.**

It is essential that MPAs detect their "sea level rise hotspots," to anticipate natural refuge areas for the purpose of protecting species and if necessary, adapting human activities, as well as removing infrastructures to accommodate the rising sea level.

Including natural buffer areas surrounding MPAs improves also the level of adaptation to external pressures and impacts, including sea level rise.

Natural sedimentation processes can be supported by enhancing the preservation and restoration of coastal wetlands, mudflats and natural reefs. Developing soft coastal protective measures and ecological engineering alternatives such as rebuilding, restoring, and channelization could be further explored to seek adaptation measures in MPAs.

MPAs will not halt change or stop many of the threats linked with climate change affecting communities however they can serve as a **powerful tool to help reduce some of these impacts and help on coastal adaptation efforts.**

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