MedEC
Mediterranean Experts on Climate and environmental Change

Coastal risks and adaptation

a Mediterranean perspective

The coastlines, where land and sea meet, represent dynamic and vital areas. They are home to unique and diverse ecosystems that support hundreds of millions of people. These coastlines are facing growing threats.

The Mediterranean's unique mix of environmental, socio-economic, and cultural factors make it a climate change hotspot. Air temperatures have already risen by +1.5°C in 2020. On the current emissions path, warming could reach +2.9°C by mi-century.

Observed changes*

*All numerical changes presented are calculated relative to the preindustrial reference period in the Mediterranean region.

+40% of marine heatwaves frequency
While the sea surface temperature increased from +0,29°C to +0,44°C per decade since 1980.

Sea surface waters pH has dropped by −0.1 UNITS
indicating significant acidification and a threat for marine biodiversity.

Sea level rises 2 TIME FASTER
in the last decade compared to the average rate of the 20th century (+2.8 mm/yr on 1993-2018).

6% of the world's greenhouse gas emissions
originate from the region, primarily from the northern nations.

Possible future*

*All projections mentioned refer to the very high greenhouse gas emission scenario from the IPCC, by the end of the 21st century.

Sea level will rise UP TO +1.01 M
relative to the 1995–2014 measurements.

DECREASING rainfall
(−16 to −49% in summer) and rising evapotranspiration lead to an increase in droughts and aridity.

UP TO +3.8°C in sea surface temperatures

Sea pH will decrease UP TO −0.46 UNITS

UP TO +7°C higher daily maximums temperatures
during summer, with intensifying heatwaves, droughts, and wildfires.

LOW-LYING AREAS
Dense urban settlements, industrial and transport infrastructures, and many UNESCO World Heritage sites are directly threatened by sea level rise.

GROWING DEMOGRAPHY
⅓ of the population live close to the coast, making them highly vulnerable to coastal changes.

ONE OF THE MOST PLASTIC-POLLUTED
regions in the world. Each minute, 0.5 tons of plastic waste, mainly from rivers, urban and agricultural areas, are entering the sea.

TOP TOURISM DESTINATION
It attracts ⅓ of the world's tourists, with over half of the EU's visitors accommodations located in its coastal areas.

BIODIVERSITY HOTSPOT
The region's ecosystems and species are highly endemic (found nowhere else), with wetlands, saltmarshes, seagrass beds, and sandy beaches providing vital ecological services.

SMALL-SCALE FISHERIES
They are vital for coastal communities and vulnerable populations. They represent 84% of the fishing fleet, and contribute 29% of total marine fishery revenue.

Understanding Coastal Risks

Marine and terrestrial Mediterranean coastal zones are vulnerable to a range of risks that can be aggravated by climate change and massive human activities

Coastline erosion

Especially around river mouths and harbors due to reduced sediment supply from rivers. The dangers of shoreline retreat are:

- *Critical infrastructure at risk (transport networks, ports, airports, cultural sites)*
- *Shrunken tourism areas*
- *Loss of vital coastal habitats*
- *Weakened coastal defenses*

→ *By 2050, the mean shoreline is projected to* ***retreat up to 23 m***
compared to 2010

Flooding

Rising sea levels significantly increase the threat of coastal flooding and permanent inundation.

Vulnerable areas
Densely populated and urbanised regions

Compound flooding threat
heavy rainfall events + rare tsunamis

→ *20 million people could be* ***permanently displaced*** *by 2100*

→ *Over 220 million people are* ***already suffering*** *from water scarcity*

Biodiversity loss

Mass mortality
Many coastal species are reaching their tolerance limits.

1,000 **invasive species** *are observed, disrupting ecosystems and biodiversity.*

→ ***Wetlands have shrunk by 50%*** *since 1970, reducing biodiversiy and natural protection against sea level rise.*

→ *Over 80% of fish* ***stocks are overfished****, with some being exploited up to six times beyond sustainable limits*

Water scarcity

It is influenced by:

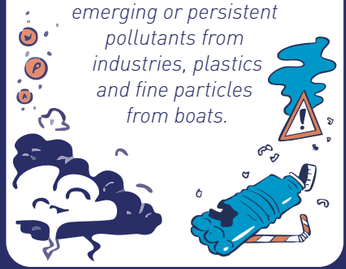
overall drying trends
from climate change

salinisation of coastal aquifers
due to seawater intrusion when the sea level rises

increasing demands
from tourism, irrigation, population growth

Accumulated pollution

Nutrients from agriculture, toxic metals, pharmaceuticals, emerging or persistent pollutants from industries, plastics and fine particles from boats.



Further impacts on people

The combination of degradations, climate change extreme events and pollution are threatening local economies, livelihoods and health of millions of citizens. Tourism, agriculture, and fisheries are particularly vulnerable.

Adaptation Measures and Solutions

Tackling these coastal risks involves enhancing protection, managing pollution, and conserving ecosystems. Effective adaptation requires tailored risk assessments and improved governance.

Present adaptation methods, mostly engineering-based, often ignore future sea-level rise, which limits their long-term effectiveness.

Reducing CO_2 emissions is crucial to avoid worsening risks in every sector.

Stronger governance, cross-border cooperation, and coordinated regulation are essential for managing resources and pollution.

Designating the region as an Emission Control Area by 2025 could cut sulfur emissions by 79% and fine particles by 24%.

Support needed for southern and eastern countries.

Natural protection

from flooding and erosion. It faces conflicting local development goals:

Nature-based solutions *are promising but require compromises in spaces and usages.*

Relocating people or infrastructure *must be well-planned. Barriers are high costs and poor social acceptance.*

Ecosystem conservation

Protection & restoration efforts
Essential but insufficient, as some losses are irreversible.

Actions to counter non-indigenous species
eradication efforts, commercial exploitation, protected areas, etc.

Renewable energies

Offshore wind, wave and solar energy
The overall shifting to renewable remains slow.

Circular and sustainable development models
Great potential for southern and eastern countries

Durable tourism

Electrifying ports *via Short-Side Electricity (SSE) to reduce CO_2 emissions.*

Encouraging sustainable tourism *with green taxes, sustainable tourism indicators, and eco-labelling.*

Pollution management

Actions to reduce pollution are more **effective at the source** *than at endpoints.*

Implementing waste-to-energy projects, recycling, reusing, sustainable farming, and better water treatment are key steps.

Water availability

To ensure long-term water security, increasing water supply should be paired with:

Reducing demand: *improving irrigation and urban water management, shifting agricultural practices through financial incentives.*

Improving water quality *with wastewater treatment that provides co-benefits (like healthier ecosystems).*

Looking ahead

Addressing Mediterranean coastal challenges and meeting Sustainable Development Goals (SDGs) requires continued innovation and effort. Collaboration among scientists, policymakers, stakeholders, and communities is crucial to develop sustainable solutions that balance environmental, social, and economic needs.

CO-CREATED PLANS

involving all relevant stakeholders ensure that solutions are tailored to local contexts and increase the likelihood of successful implementation.

REDUCING INEQUALITIES

Empowering marginalized and vulnerable groups (women, elderly, children) in decision-making for creating inclusive and effective sustainable development pathways.

STABILITY & RESILIENCE

Sustainable development relies on political and economic stability, alongside locally-adapted, circular and resilient development models.

Mitigation
TACKLING AT THE SOURCE

Cut CO2 emissions and tackle pollution directly.

Adopt sustainable power sources to reduce reliance on fossil fuels and support long-term energy needs.

Embrace waste-to-energy projects, ramp up recycling, and enhance water treatment.

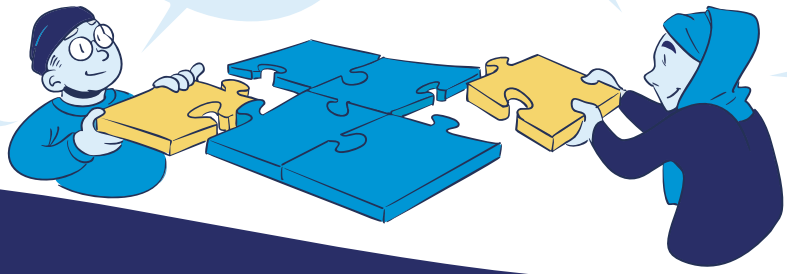
Safeguard and restore "blue carbon ecosystems" which capture CO_2 and provide vital protection or depollution services.

Adaptation
AND SUSTAINABLE TRANSITION

Ensure equal access to basic services (such as healthcare and education) across cities and regions.

Achieve resilience through circular economies, integrating sustainable practices in sectors such as tourism and fisheries.

Focus on local, adaptive strategies for agriculture and coastal management to ensure long-term sustainability and food security



In conclusion

Achieving sustainable development in the Mediterranean coastal zone requires a transformative approach that addresses environmental challenges while promoting social equity and economic stability. By integrating circular development models, investing in renewable energy, protecting blue carbon ecosystems, and engaging all stakeholders in the decision-making process, the Mediterranean region can move towards a more resilient and sustainable future.

This overview, providing a snapshot of risks and solutions for the Mediterranean coastline, is based on a comprehensive scientific and technical assessment by the MedECC. For more detailed information, including the full report and further insights into the work of MedECC, please visit the following link:

www.medecc.org

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