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Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON) Coast and Hydrography

Teleconference, 30 September 2025

Agenda Item 3:

Proposal of Climate Change-related CIs within EO7 and EO8

UNEP/MAP PAP/RAC
Split, 2025

Note by the Secretariat

The CORMON Coast and Hydrography meeting (Rome, 15-16 July 2025) among other agenda items discussed the proposal of the climate change-related Common Indicators. Following the thorough discussions the meeting concluded that more time is needed to study and reflect on their exact titles, GES and targets. The participants agreed to provide to PAP/RAC comments and suggestions on the proposed indicators after consultations with relevant national counterparts, by end October 2025.

On 15 September 2025 the meeting of the 12th EcAp Coordination Group was held where the revision of EcAp policy of UNEP/MAP and the updates of IMAP were the main agenda items. The meeting felt that climate change is an emerging issue very much relevant for the Mediterranean region and that therefore it would be a pity not to have some climate related-indicators included in the IMAP List of common indicators. To this end, and considering the momentum with regard to climate change, the 12th Meeting of the EcAp Coordination Group suggested that the updated IMAP should consider climate change, and agreed to recommend to the Meeting of the MAP Focal Points (Athens, Greece, 16-19 September 2025) the possibility to receive a proposal from the CORMON Coast and Hydrography meeting (on-line) by the end of September 2025 on climate change-related common indicators. Namely, the CORMON should address the possibility to activate indicators 7.1.1 and 7.1.2 of EO7 already proposed under Annex I to the draft Decision 27/6 (UNEP/MED WG.632/Inf.2), and the possibility for the inclusion of 1 to 3 indicators under EO8, considering that these indicators are measurable and that the methodology is clear, based on the ongoing discussion held under CORMON Coast and Hydrography.

Also, the Meeting recommended the EcAp Coordination Group members, the proposed course of action, as provided for above, to coordinate at national level to ensure that the CORMON Coast and Hydrography can make proposals, as appropriate, for consideration by the Meeting of the Contracting Parties to the Barcelona Convention and its Protocols (COP24), through the Secretariat in line with the Rules of Procedure for the submission of the working documents to COP24.

Proposal of Climate Change-related Common Indicators (CIs) within Ecological Objective (EO)7 and EO8

In summary, the proposed climate change -related Common Indicators (CIs) within Ecological Objective (EO)7 and EO8 are as follows:

EO7 Hydrographic alterations
1. **Large scale changes in circulation patterns, wave height, temperature, pH, and salinity distribution**
2. **Long term changes in sea level**

Both proposed CIs have already been adopted by the COP 17 (Decision IG.20/4) under 7.1.1. and 7.1.2.

EO8 Coastal ecosystems and landscapes
3. **Area of restored degraded coastal wetlands**
4. **Extent and frequency of coastal flooding**
5. **Changes in burnt forest areas**

Each of the proposed CIs is presented in more details below including its rationale / justification, GES definition, target, policy context, methodology for indicator calculation, indicator units and data sources.

EO7 Hydrographic alterations

1. **Large scale changes in circulation patterns, wave height, temperature, pH, and salinity distribution**

This indicator is already included as 7.1.1. in the Annex I to the draft Decision 27/6 (UNEP/MED WG.632/Inf.2). The CORMON meeting is invited to address the possibility to activate it.

Rationale / Justification

This indicator monitors critical large-scale changes in the physical and chemical characteristics of marine ecosystems. These shifts are directly linked to climate change, anthropogenic pressures, and natural variability. These parameters are changing rapidly due to climate change and such alterations may have much stronger impacts on marine habitats and ecosystems than those monitored by the CI 15 on hydrography itself.

Understanding changes in these parameters are critical for assessing the impacts of climate change on marine ecosystems, coastal communities, and global climate systems. Monitoring changes in these parameters over time provides valuable insights into long-term trends and shifts in climate patterns. Variations in sea temperature, acidity[1], and salinity, for example, can affect the distribution of species and alter habitat suitability, while wave energy and currents influence nutrient transport and primary productivity. Changes in sea temperature and salinity contribute to thermal expansion, resulting in sea level rise. Changes of the level of acidity describes the ongoing process of decreasing pH due to increased absorption of atmospheric CO_2. In addition to water surface temperatures, the wind systems are a crucial determinant of sea currents. As atmospheric temperatures continue to rise, this is anticipated to have various effects on the strength of surface sea currents, wind-driven circulation, and dispersal patterns.

Therefore, it is important to introduce monitoring of basic hydrographic parameters, i.e. salinity, temperature, acidity, waves, and currents, along with bathymetry, as a priority monitoring activity within EO7. These parameters are not only relevant for the overall EO7 but are equally important for the assessment of other EOs and specific indicators related to pollution, eutrophication, and biodiversity.

[1] To show the process of changing acidity, i.e. acidification. "Ocean acidity" refers to the state or level of acidity in seawater, often expressed in terms of pH value. "Ocean acidification" describes the ongoing process of decreasing pH due to increased absorption of atmospheric CO_2, i.e. the long-term chemical changes caused by human activities. Ex: "The study examines the effects of increasing ocean acidity on marine ecosystems." (focus on pH level), "Ocean acidification is driven by rising atmospheric CO_2 concentrations." (focus on the process)

Therefore, it is of paramount importance to put in place an integrated system of monitoring. Remote sensing methods should be used as much as possible to rationalise monitoring efforts as well as other available sources to determine the hydrographic alterations in the Mediterranean region. In the EU Marine Strategy Framework Directive (MSFD) such actions are already envisaged as well.

Proposal for the GES definition and target

The GES and Targets below have been agreed by the Decision IG.20/4 at COP 17 (Paris, France, 8-10 February 2012) that adopted 11 Ecological Objectives where under EO7 this CI is listed under 7.1.1 (UNEP/MED WG.632/Inf.2).

GES: Ecosystems are resilient enough to adapt to climate change
Target: Anthropogenic impacts which may alter ecosystems' adaptive capacity are reduced.

The meeting can consider changing of the agreed GES and targets and the proposals below can be taken into account as suggestions:

Good Environmental Status (GES) for this indicator reflects a balanced, stable marine environment where:
- Ocean circulation patterns support ecosystem services and biodiversity.
- Wave heights are within natural variability without intensifying coastal erosion risks.
- Temperature increases are minimized, ensuring thermal stability for marine life.
- pH levels are maintained to prevent severe ocean acidification, safeguarding calcifying organisms.
- Salinity distribution remains consistent, supporting thermohaline circulation and ecosystem health.

Policy context
This indicator aligns with multiple global and regional frameworks:
- Sustainable Development Goals (SDG): Supports SDG14 (Life Below Water) to conserve and sustainably use oceans and marine resources.
- EU Policies: Contributes to the Marine Strategy Framework Directive (MSFD) for achieving GES.
- ICZM Protocol: Integrated coastal zone management under the Barcelona Convention.
- Post-2020 SAP BIO: Advances regional biodiversity targets in the Mediterranean.
- MSSD (Mediterranean Strategy for Sustainable Development): Enhances climate resilience in marine and coastal ecosystems.

Methodology for indicator calculation
- Circulation patterns: use satellite data and oceanographic models to assess large-scale current systems.
- Wave height: analyze buoy and satellite measurements to identify trends in significant wave heights.
- Temperature: assess sea surface and subsurface temperature variations through remote sensing and in situ measurements.
- Salinity distribution: map salinity changes through conductivity-temperature-depth (CTD) sensors and ARGO floats.
- pH: monitor ocean acidification trends using pH sensors and carbonate chemistry analysis.

Indicator units
- Circulation patterns: Speed (m/s), direction (degrees).
- Wave height: Meters (m).
- Temperature: Degrees Celsius (°C).
- Salinity: Practical Salinity Units (PSU).
- pH levels: pH scale.

Data sources
- Satellite systems (e.g., Copernicus Marine Environment Monitoring Service).
- Oceanographic buoys and ARGO floats.

- National meteorological and hydrological institutes.
- Research institutions and international programs (e.g., Global Ocean Observing System - GOOS).

2. Long term changes in sea level

This indicator is already included as 7.1.2. in the Annex I to the draft Decision 27/6 (UNEP/MED WG.632/Inf.2). The CORMON meeting is invited to address the possibility to activate it.

Rationale / Justification

Sea level change is a critical indicator of global climate change. It reflects the combined impacts of thermal expansion due to rising ocean temperatures, melting glaciers and ice sheets, and changes in land water storage. Research indicates a rise of approximately 0.5–1 meter in the Mediterranean basin by 2100, with significant impacts on low-lying coastal areas. Long-term sea level changes significantly impact coastal ecosystems, infrastructure, and communities, leading to increased flooding, erosion, and loss of habitat. Monitoring this indicator is essential for developing effective mitigation and adaptation strategies to protect vulnerable regions and ensure sustainable development.

Sea level rise significantly influences land cover change in coastal regions. As sea levels rise, low-lying areas are increasingly prone to flooding, leading to the submergence of land and the loss of habitats such as wetlands and agricultural zones. This process accelerates coastal erosion, reshaping shorelines and reducing the availability of arable land. Additionally, saltwater intrusion into freshwater systems alters soil salinity, making previously fertile lands unsuitable for agriculture. Urban areas near coasts may also experience infrastructure damage, prompting land-use changes as communities adapt or relocate.

These changes directly link to Indicator 25, as shifts in land cover due to sea level rise impact biodiversity, ecosystem services, and human livelihoods. Monitoring these dynamics is crucial for sustainable coastal management and climate adaptation strategies.

Proposal for the GES definition and target

Similarly as for the CI under point 1 the GES and Targets below have been agreed by the Decision IG.20/4 at COP 17 (Paris, France, 8-10 February 2012)where under EO7 this CI is listed under 7.1.2 (UNEP/MED WG.632/Inf.2).

GES: Ecosystems are resilient enough to adapt to climate change
Target: Anthropogenic impacts which may alter ecosystems' adaptive capacity are reduced.

The meeting can consider changing of the agreed GES and targets and the proposals below can be taken into account as suggestions:

Good Environmental Status (GES) for this indicator is achieved when:
- Sea level rise is minimized to levels consistent with natural variability and global climate targets, reducing impacts on coastal ecosystems and human activities.
- Coastal areas are resilient to sea level changes through adaptive management and sustainable planning.
- The balance between natural processes and human intervention ensures minimal adverse effects on marine and coastal biodiversity.

Policy context

This indicator supports several international and regional frameworks:
- Sustainable Development Goals (SDG): Aligns with SDG14 (Life Below Water) and SDG13 (Climate Action), addressing climate resilience in marine and coastal areas.

- EU Policies: Contributes to the Marine Strategy Framework Directive (MSFD) and the EU Adaptation Strategy.
- ICZM Protocol: Central to integrated coastal zone management under the Barcelona Convention.
- Post-2020 SAP BIO: Supports biodiversity and climate adaptation in the Mediterranean.
- MSSD (Mediterranean Strategy for Sustainable Development): Promotes climate adaptation and mitigation in marine and coastal regions.

Methodology for indicator calculation

- Sea Level Observations: analyze satellite altimetry data to measure global and regional trends in sea level.
- Tide Gauge Data: use historical and current tide gauge records to assess long-term local changes.
- Contributing factors: evaluate the relative contributions of thermal expansion, ice melt, and changes in land water storage through climate models and observational data.

Indicator units

Sea level change is measured in millimeters per year (mm/year).

Data sources

- Satellite missions (e.g., TOPEX/Poseidon, Jason series, Copernicus Sentinel-6).
- Tide gauge networks (e.g., Global Sea Level Observing System - GLOSS).
- Climate models from research institutions and international programs (e.g., Intergovernmental Panel on Climate Change - IPCC).
- National meteorological and oceanographic agencies.

EO8 Coastal ecosystems and landscapes

3. Area of restored degraded coastal wetlands

Rationale / Justification

Mediterranean wetlands, located in a biodiversity hotspot are crucial habitats for flora and fauna, especially migratory birds. Over the last century, nearly 50% of Mediterranean coastal wetlands have been lost due to human pressures, sea-level rise, warming, and extreme climate events. Coastal wetlands provide essential ecosystem services including habitat for wildlife, flood regulation, buffers against erosion and carbon sequestration.

They support endemic species and plant communities adapted to salinity and water fluctuations, stabilizing soil and regulating the microclimate. Economically, wetlands act as natural water purifiers, saving billions in treatment costs, support agriculture, and provide livelihoods through diverse fish species. They also foster ecotourism and outdoor activities.

Despite their value, wetlands face threats from urbanization, pollution, altered water regimes, and climate change. Sea-level rise, altered precipitation patterns, and increasing temperatures can irreversibly modify ecosystems, leading to biodiversity loss and exacerbating climate change. Adaptive management strategies integrating wetland conservation into broader landscape and coastal plans are essential. Restoration plans should be developed for degraded coastal wetlands.

Restoring degraded coastal wetlands is therefore crucial for maintaining biodiversity, improving water quality, and enhancing resilience to climate change.

First proposal for the GES definition and target

GES: Natural dynamics of coastal wetlands is achieved when these areas are restored to a condition that supports their ecological functions, biodiversity and resilience.
Target: Restoration of at least 50% of the total area of habitats within the wetlands that are not in good condition by 2050.

Policy context

Restoration of coastal wetlands aligns with several international and regional policies and frameworks:

- Sustainable Development Goals (SDGs): In addition to Goal 14 (Life Below Water) and Goal 15 (Life on Land), coastal management and wetlands are also addressed under Goal 6 (Clean Water and Sanitation), Goal 13 (Climate Action) and Goal 11 (Sustainable Cities and Communities).

These goals underscore the importance of wetlands in achieving sustainable development, protecting biodiversity, and enhancing resilience to climate change.

- ICZM Protocol: In its Article 10 on specific coastal ecosystems recognises coastal wetlands as crucial ecosystems. It calls for prevention from disappearance and requires Parties 'to undertake restoration of degraded coastal wetlands with a view to reactivating their positive role in coastal environmental processes'.
- Post 2020 SAP BIO: Strategic Action Programme for the conservation of Biological Diversity in the Mediterranean region provides some specific details on the restoration of wetlands in the Mediterranean region, namely: The Post-2020 SAP BIO aims to reverse the loss of biodiversity and put Mediterranean marine and coastal biodiversity on the path to recovery by 2030, and emphasises the importance of restoring degraded coastal wetlands to enhance their ecological functions, support biodiversity, and improve resilience to climate change.
- Mediterranean Strategy for Sustainable Development (MSSD): emphasizes the importance of restoring degraded coastal wetlands to enhance their ecological functions, support biodiversity, and improve resilience to climate change. Wetlands are recognized for their role in water purification, flood mitigation, groundwater replenishment, sediment retention, and carbon sequestration. The strategy advocates for the integration of NbS into national policies across sectors. This includes using wetlands for natural flood defense, enhancing biodiversity, and supporting climate adaptation efforts.

- European Union policies: Including the EU Biodiversity Strategy for 2030 and the Water Framework Directive and the EU Nature Restoration Law.
- EU Biodiversity Strategy for 2030: Aims to put Europe's biodiversity on a path to recovery by 2030, with specific actions to protect and restore ecosystems1.
- Water Framework Directive: Focuses on achieving good qualitative and quantitative status of all water bodies, including coastal waters, by reducing pollution and ensuring sustainable water use2.
- EU Nature Restoration Law: Sets binding targets for restoring degraded ecosystems, including wetlands, with the goal of restoring at least 30% of the EU's land and sea areas by 2030 and 90% of all ecosystems in need of restoration by 2050. Member states are required to develop national restoration plans outlining specific measures, timelines, and financial resources.

Methodology for indicator calculation

The area of restored degraded coastal wetlands is calculated using satellite imagery, GIS mapping, and field surveys. Restoration projects are monitored to assess changes in vegetation cover, water quality, and wildlife presence. Data is collected periodically to track progress and ensure restoration goals are met.

Indicator units

The indicator is measured in hectares (ha) of restored wetlands.

Data sources

Data for this indicator is sourced from:

- Satellite imagery and remote sensing data.
- National and regional environmental agencies.
- Reports from restoration projects and scientific studies.
- Field surveys conducted by environmental organizations and research institutions.

4. Extent and frequency of coastal flooding

Rationale / Justification

Coastal flooding is a key climate change impact, affecting ecosystems, infrastructure, and communities. Monitoring its extent and frequency supports adaptive management and risk reduction strategies under IMAP.

In the Mediterranean, coastal flooding has intensified due to rising sea levels, increased storm surges, and changing precipitation patterns linked to climate change. The region’s densely populated coastlines, critical tourism and economic activities, and rich biodiversity make it particularly vulnerable. Key factors contributing to heightened flood risks include:

- Sea Level Rise: The Mediterranean has experienced a measurable rise in sea levels, increasing the frequency of high-tide flooding and exacerbating storm impacts.
- Extreme weather events: More intense and frequent storms are leading to stronger storm surges and flash floods, particularly in low-lying coastal areas.
- Land subsidence and coastal erosion: Many Mediterranean coastlines suffer from land subsidence and erosion, further exposing infrastructure and natural habitats to flood risks.
- Urbanization and habitat loss: Expanding coastal urban areas and loss of natural buffers (e.g., wetlands, dunes) reduce the capacity of coastal systems to absorb floodwaters.
- Economic and social Impacts: Flooding threatens vital industries such as tourism, fisheries, and maritime trade, while also increasing risks to human settlements and cultural heritage sites.

Given these challenges, assessing the extent and frequency of coastal flooding is crucial for informing climate adaptation policies, enhancing disaster preparedness, and strengthening coastal resilience.

First proposal for the GES definition and target

GES: Coastal flooding occurrences are minimized in terms of the frequency and severity of flooding events, and their impacts on coastal ecosystems and human activities are reduced to acceptable levels.
Target: Decreasing the number of flooding events per year or decade; reducing the extent of inundation during each flood event; lowering the socio-economic and environmental damage caused by coastal floods.

Policy context
- SDGs: Supports SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 11 (Sustainable Cities and Communities).
- EU Policies: Aligns with the EU Floods Directive, EU Strategy on Adaptation to Climate Change, and the Marine Strategy Framework Directive (MSFD).
- ICZM Protocol: Reinforces integrated coastal management to mitigate flood risks.
- Post-2020 SAP BIO: Ensures biodiversity resilience to climate-induced hazards.
- MSSD: Addresses climate resilience as part of Mediterranean sustainable development.
- The Kunming-Montreal Global Biodiversity Framework (GBF): Strengthens ecosystem restoration, pollution control, and sustainable use practices that contribute to reducing the impacts of flooding.

Indicator units
- Extent: Square kilometers (km^2) of flooded coastal areas.
- Frequency: Number of flooding events per year or decade
- Possibly also risk assessment

Methodology for indicator calculation
- Extent measurement: Utilizes remote sensing, GIS mapping, and in-situ data to assess the spatial reach of flooding events.
- Frequency calculation: Based on historical records, satellite imagery, and possibly hydrodynamic modelling to determine recurrence intervals.

Data sources
- Satellite observations (e.g., Sentinel, Landsat)
- Tide gauge and sea-level monitoring stations
- National and regional meteorological and oceanographic agencies
- Local coastal impact reports and historical records

5. Changes in burnt forest areas

Rationale / Justification

Climate change increases the risk of forest fires in the Mediterranean through higher temperatures, prolonged droughts, and more intense heatwaves, creating ideal conditions for fires to ignite and spread. Such changing weather patterns, combined with more frequent extreme events, make forests and other vegetation types more vulnerable and firefighting efforts more challenging.

Tracking data on forest fires in the Mediterranean is crucial because it helps predict fire risks, improve response strategies, and mitigate environmental and economic damage. The region’s hot, dry climate makes it highly vulnerable, and monitoring trends allows for better prevention and adaptation to climate change. Arid conditions, higher frequency of heat-induced fire weather and land abandonment create dangerous conditions, leading to anomalous wildfires and forest die-back.

Intense wildfires impact human health and community safety, destroying private and public assets. When forests, trees and maquis shrublands are lost, the consequences are far-reaching and long-lasting: flood risks increase; infrastructure is threatened; biodiversity declines; and soil and watersheds are impacted, with consequences for local livelihoods, desertification and droughts, transboundary relationships and regional development. Wildfires generate air pollution, impacting public health; and contribute to a climate change feedback loop by emitting huge quantities of greenhouse gases into the atmosphere, spurring more warming, more drying, and more burning.

In 2017, only in the North Mediterranean region, nearly 900,000 hectares burned, equivalent to the total area of Cyprus, and the highest figure recorded since 1985 (WWF, 2019). In 2023, in just 12 days, 135,000 hectares of forest and other wooded lands in Algeria, Greece, Italy and Tunisia were destroyed or damaged (JRC, 2023).

First proposal for the GES definition and targets

GES: Wildfires occur within natural ecological thresholds, preventing large-scale destruction while maintaining biodiversity and ecosystem resilience.
Target: Minimizing human-caused fires; ensuring that burnt areas regenerate naturally or through restoration; and keeping fire frequency and intensity low enough to sustain healthy forests, soil, and carbon storage.
Reduce burnt area by 30–50% by 2035
Restore at least 50% of fire-damaged forests by 2035

Policy context
- UN Sendai Framework for Disaster Risk Reduction (2015–2030) – Focuses on disaster prevention, including wildfires, through risk assessment and resilience strategies.
- UNFCCC & Paris Agreement – Addresses climate change, which exacerbates fire risks, promoting adaptation strategies.
- ICZM Protocol: In its Article 10 on specific coastal ecosystems recognizes coastal forests and woods as crucial ecosystems. It calls for adoption of measures intended to preserve or develop coastal forests, in particular outside specially protected areas.
- EU Forest Strategy (2021–2030) – Strengthens wildfire resilience and promotes sustainable forestry.
- Silva Mediterranea Initiative (by FAO) – Supports sustainable forest management in the Mediterranean, including fire prevention.
- European Green Deal & Climate Adaptation Strategy – Aims to reduce wildfire risks through climate resilience measures.

Methodology for indicator calculation
- Change in forest burnt area: (Burnt Area - Burnt Area$_{t-1}$\Burnt Area$_{t-1}$) x100 (in %)
- Burnt Area as % of Total Forest Area to assess relative impact.
- Fire Severity Index (burn intensity, vegetation loss).

Data sources
- European Forest Fire Information System (EFFIS)

Managed by the European Commission's Joint Research Centre (JRC), EFFIS provides detailed data on forest fires across Europe, including the Mediterranean region. Features: Real-time fire monitoring; historical fire data (burnt areas, intensity); fire risk assessments.
- Copernicus Emergency Management Service (EMS)

Part of the European Union's Earth Observation program, EMS provides satellite-based data for monitoring natural disasters, including forest fires. Features: fire mapping and analysis; burnt area mapping using satellite imagery (e.g., Sentinel-1, Sentinel-2); rapid damage assessment and fire impact mapping.
- MODIS (Moderate Resolution Imaging Spectroradiometer)

Managed by NASA, MODIS provides satellite imagery and data on wildfires, including burnt areas. It's widely used for tracking fire events globally, including the Mediterranean. Features: near real-time fire detection; burnt area mapping; historical fire data.

- Global Wildfire Information System (GWIS)

Managed by the Global Fire Monitoring Center (GFMC) in collaboration with other organizations, GWIS tracks global wildfire data and includes Mediterranean fire information. Features: global fire monitoring; burnt area and intensity dana; risk assessments and trends.

- FIRMS (Fire Information for Resource Management System)
- Global Fire Emissions Database (GFED)
- Sentinel Hub
- National Forest Fire Database (specific countries)

Many Mediterranean countries maintain their own national fire databases with local-specific data (e.g., Italy, Spain, Greece). These databases can be accessed through national environmental or fire agencies.