UNITED NATIONS

EP

UNEP/MED WG.630/8

UN environment programme

Mediterranean Action Plan
Barcelona Convention

24 July 2025
Original: English

12th Meeting of the Ecosystem Approach Coordination Group

Athens, Greece, 15 September 2025

Agenda Item 4: Revised Integrated Monitoring and Assessment Programme (IMAP) for the Mediterranean Sea and Coast:
(c) Updated Guidance Factsheets for Common Indicators 15 and 16

Updated Guidance Factsheets for Common Indicators 15 and 16

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UNEP/MAP
Athens, 2025

Note by the Secretariat

The Guidance Factsheets for Common Indicator (CI) 15 "*Location and extent of the habitats potentially impacted by hydrographic alterations*" related to the Ecological Objective 7 (Hydrographic alterations) and CI 16 "*Length of coastline subject to physical disturbance due to the influence of human-made structures*" related to Ecological Objective 8 (EO 8: Coastal Ecosystems and Landscape) have been adopted by the 7th Meeting of the Ecosystem Approach Coordination Group (EcAp CG) (Athens, Greece, 9 September 2019). Since then, they have been updated based by the experience and lessons learnt from their application for the preparation of the 2023 Mediterranean Quality Status Report (MED QSR).

In particular for the CI15 on hydrography the Contracting Parties reported difficulties to monitor in line with the methodology originally agreed. Therefore, the Guidance Factsheet has been simplified to allow reporting on structures (i.e., footprint and the surrounding area) where habitats can be potentially impacted. These areas should be estimated based on the data/information extracted from the Environmental Impact Assessment (EIA) reports required for such structures.

The Guidance Factsheet for the CI 16 "*Length of coastline subject to physical disturbance due to the influence of human-made structures*" has been revised to include among the structures to be monitored also "archaeological remains" and "other" structures that do not fall under any other category (e.g., parking lots, quarries, pilings, if not part of port and marinas). The off-shore breakwaters, considered as artificial structures, as well as the coastline if landward structures intersect the reference coastline, are among the additions to this revised version, all presented in this document in highlighted text.

These upgrades have been reviewed and agreed by the CORMON Meeting on Coast and Hydrography Monitoring (Teleconference, 17 October 2024), presented to the Meeting of the PAP/RAC Focal Points (Athens, Greece, 6-7 May 2025), and were adopted by the CORMON Meeting on Coast and Hydrography Monitoring (Rome, Italy, 15-16 July 2025).

The present document is submitted to the 12th Meeting of the EcAp Coordination Group (EcAp) (15 Sept. 2025) for approval.

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Indicator Guidance Factsheet for the Common Indicator 15

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.	
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations	
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**
Negative impacts due to new structure are minimal with no influence on the larger scale coastal and marine system.	Alterations due to permanent constructions on the coast and watersheds, marine installations and seafloor anchored structures are minimised.	Planning of new structures takes into account all possible mitigation measures in order to minimize the impact on coastal and marine ecosystem and its services integrity and cultural/historic assets. Where possible, promote ecosystem health.

Rationale

Justification for indicator selection

After agreeing to progressively apply the ecosystem approach (EcAp) to the management of human activities in the Mediterranean at the 15th Meeting of the Contracting Parties to the Barcelona Convention (COP15, 2008), the Contracting Parties agreed, at COP17 in 2012, on an overall vision and goals for EcAp, and on 11 ecological objectives for the Mediterranean. Among these ecological objectives was the Ecological Objective 7 („Alteration of hydrographical conditions“), with its clearly outlined operational objectives and indicators. EO7 corresponds to Descriptor 7 (Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems) of the European Marine Strategy Framework Directive (MSFD).

Ecological Objective 7 („Alteration of hydrographical conditions“) addresses permanent alterations in the hydrographical regime of currents, waves and sediments due to new large-scale developments that have the potential to alter hydrographical conditions. An agreed common indicator - 'Location and extent of habitats potentially impacted by hydrographic alterations' considers marine habitats which may be affected or disturbed by changes in hydrographic conditions (currents, waves, suspended sediment loads).

There is a clear link between EO7 and other ecological objectives, especially EO1 (Biodiversity). Such link needs to be determined on a case-by-case basis. Refer to Annex 1 for habitats to be considered in EO7. Ultimately, the assessment of impacts, including cumulative impacts, is a cross-cutting issue for EO1 and EO7.

Scientific References

EC JRC (2015). Review of Commission Decision 2010/477/EU concerning MSFD criteria for assessing good environmental status Descriptor 7: Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems

EMEC Ltd (2005). Environmental impact assessment (EIA) guidance for developers at the European Marine Energy Centre.

OSPAR Commission (2012). MSFD Advice document on Good environmental status - Descriptor 7: Hydrographical conditions. A living document - Version 17 January 2012.

OSPAR Commission (2013). Report of the EIHA Common Indicator Workshop.

Royal Haskoning DHV (2012). Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) Evaluation of assessment tools and methods. Lot 2: Analysis of case studies of port development projects in European estuaries. Tidal Rover Development (TIDE) Interreg IVB

Some reference and guidance documents on EIA can be found at:

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

http://ec.europa.eu/environment/eia/eia-support.htm and in the „Guidance Document

on how to reflect changes in hydrographical conditions in relevant assessments" (UNEP/MAP/PAP, 2015).

Policy Context and targets

Policy context description

Following the COP17 agreement on an overall vision and goals for EcAp, on 11 ecological objectives, operational objectives and indicators for the Mediterranean, a six-year cyclic review process of EcAp implementation was established (EcAp MED I 2012-2015), with the next EcAp cycle set to cover 2016-2021.

At COP18, in 2013, the targets for achieving GES of the Mediterranean Sea and its coastal zone by 2020 were adopted. In addition, through Decision IG. 21/3 (the so called "COP18 EcAp Decision") the EcAp roadmap was agreed on. The Contracting Parties also agreed to design an Integrated Monitoring and Assessment Programme (IMAP) by COP19, which would, for the first time, ensure a common assessment basis for the Mediterranean marine and coastal environment. At COP19, in 2016, the IMAP was adopted. The IMAP provides guidance to the parties on how to practically implement quantitative monitoring and assessment of the ecological status of the Mediterranean Sea and coast in line with the EcAp.

As part of the EcAp roadmap, expert-level monitoring discussions took place in the various Correspondence Groups on Monitoring (CORMONs) meetings on Biodiversity and Fisheries; Pollution and Litter; and Coast and Hydrography sub-clusters. An Integrated Correspondence Group on Monitoring Meeting (Integrated CORMON) took place on 30 March-1 April 2015, to discuss the main elements of the Integrated Monitoring and Assessment Programme.

As for Protocols of the Barcelona Convention relevant for the EO7, the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean calls to Contracting Parties of the Barcelona Convection for continuous monitoring of ecological processes, population dynamics, landscapes, as well as the impacts of human activities (Article 7 b). In addition, it calls to Parties to evaluate and take into consideration the possible direct or indirect, immediate or long-term impacts, including the cumulative impact of the projects and activities, on protected areas, species and their habitats (Article 17).

Another Protocol of the Barcelona Convention, the Protocol on the Integrated Coastal Zone Management in the Mediterranean, in its Article 9, calls for Parties to minimize negative impacts on coastal ecosystems, landscapes and geomorphology, coming from infrastructure, energy facilities, ports and maritime works and structures; or where appropriate to compensate these impacts by non-financial measures. In addition, the Article 9 demands maritime activities to be conducted "in such a manner as to ensure the preservation of coastal ecosystems in conformity with the rules, standards and procedures of the relevant international conventions".

Out of other international legislation that can be relevant for the EO7 Ecological Objective, it is essential to mention Marine Strategy Framework Directive – MSFD 2008/56/EC since EcAp's EO7 corresponds to MSFD's Descriptor 7 to large extent. The hydrographical conditions outlined under the MSFD are, to a large extent, comparable to the hydromorphological conditions referred to under the Water Framework Directive (WFD) which calls for the protection of all water resources, including coastal waters. EO7 overlaps with other policy frameworks, such as the Environmental Impact Assessment (EIA) procedure on the assessment of the environmental impacts of certain public and private projects; the Strategic Environmental Assessment (SEA) procedure on the assessment of the effects of certain plans and programs on the environment; assessments undertaken under Marine Spatial Planning (MSP); and in the context of integrated coastal zone management (ICZM).

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

Targets

Planning of new structures takes into account all possible mitigation measures in order to minimize the impact on coastal and marine ecosystem and its services, integrity and cultural/historic assets. Where possible, promote ecosystem health.

Policy documents

Protocol on the ICZM in the Mediterranean - http://www.pap-thecoastcentre.org/pdfs/Protocol_publikacija_May09.pdf

Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean - http://www.rac-spa.org/sites/default/files/protocole_aspdb/protocol_eng.pdf

MSFD Directive - http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN

Other EU-related documents can be found at: http://ec.europa.eu/environment/eia/eia-support.htm

Indicator analysis methods

Indicator Definition

The EO7 Common Indicator reflects location and extent of the habitats potentially impacted by the alterations and/or the circulation changes induced by them. It concerns area/habitat of the seafloor lost by the construction of the structure itself, i.e. the „footprint“ of the structure; and the surrounding area of potentially affected habitats. This surrounding area should be estimated based on the data/information extracted from the EIA (Environmental Impact Assessment) and/or Strategic Environmental Assessment (SEA) procedures to which these structures are subject.

Methodology for indicator calculation

Methodology used for indicator measurement encompasses elaboration on:

(i) Mapping of the area where human activities cause permanent loss of the seafloor by the construction of the structure itself, i.e. the „footprint“ of the structure; and

(ii) Mapping of the surrounding area around the structure of potential changes to habitats. These areas (under i and ii) should be estimated based on the data/information extracted from the Environmental Impact Assessment (EIA) and/or Strategic Environmental Assessment (SEA) reports required for such structures and possibly from Marine Spatial Planning (MSP) documents; and

(iii) Intersection of the spatial map of the areas of these hydrographical changes (defined under i and ii) with spatial maps of habitats to determine the areas of individual habitat types that are impacted by hydrographical changes. Link to EO1- habitat map. Until the habitat map from EO1 is available the Contracting Parties will use their own habitat maps.

New structures to be considered under EO7 assessment:

As far as the type and dimension of structures to be taken into account: use the case by case approach depending on the nature of the coast, the function of the structure and the depth reached by the structure where appropriate threshold values are taken into account (such as absolute surface in m², range of depths where structure will be built (to avoid habitat “segmentation”)). As an additional criterion it was agreed that all permanent structures, for which an EIA and/or a planning/building permit is required, should be considered.

If the EIA does not provide a sufficient level of information, other available sources of information concerning similar or close sites have to be explored: historical evolution of sediment supply, analysis of the evolution of the coastline and the seabed, analysis of the impact of existing defence structures and ports on the morphodynamics of the coastline and alike.

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

These available data and studies are not directly applicable to assess hydrographical alterations induced by the new structure. Nevertheless, they can be used by experts to extrapolate evolution tendencies on the site of interest, thus providing a first level of characterization of expected hydrographic alterations and allowing to roughly specify their extent and location.

At the end, the results of the above assessments are integrated on one single GIS layer (i.e. hydrographical alterations GIS layer). The last step of the EO7 indicator calculation consists of overlaying hydrographical alterations GIS layer with habitats GIS maps/layer. Calculations are made with GIS tools in order to define habitats potentially impacted by hydrographic alterations.

If the assessment of hydrographic alterations presents a high level of uncertainty, a risk-based approach can be used to identify habitats that are most sensitive to expected alterations. To do this sensitivity matrix can be used (see for instance: La Rivière M. et al., 2018. *An assessment of French Mediterranean benthic habitats' sensitivity to physical pressures.* UMS PatriNat, AFB-CNRS-MNHN. Paris, 86 pp.).

Due to the ecological importance of *Posidonia* meadows in the Mediterranean Sea and their vulnerability to coastal development, a specific paragraph for this habitat is presented.

Particular considerations for *Posidonia* meadows:

In addition to direct impacts, induced by the structure itself, which will definitively destroy the meadow by recovery, some construction techniques and then indirect impacts, following its construction, on currents and sedimentary transport, may also alter this habitat, on areas much larger than the structure footprint.

Indeed, the *Posidonia* is very sensitive to water turbidity, even transient. Also, during the construction of the structure, a turbid cloud can be generated (discharge at sea of fine materials). This turbid cloud will decrease the transparency of the water, and therefore photosynthesis, in the short term; it can also be deposited on the seagrass meadow that can cause smothering by hyper sedimentation. The thinnest sediments can also be resuspended during storms, thus decreasing the transparency of the water in the long term. Major seagrass meadow destructions due to these phenomena have been observed, for example, in France following the construction of the ports of Pointe Rouge in Marseille and Mouillon in Toulon.

Moreover, the construction machines are often fixed on the bottom, for stability reasons, directly and / or by means of anchors, which has a very negative impact on the bottoms: digging holes (feet of the machines) or furrows (chains of anchors) in the *Posidonia oceanica* meadows.

Once the structure is built, its presence can modify the sedimentary transit and induce areas of erosion and accumulation around it. These modifications will alter the equilibrium between the sedimentation rate and the vertical growth of *Posidonia*. So, if the rate of sedimentation exceeds 5-7cm / year, the vegetative points die; conversely, if this rate is zero or negative (sediment departure), the rhizomes are loosened; they are then very sensitive to breakage (hydrodynamism, anchors, trawling, etc.)

It should also be noted that it is extremely rare for a seagrass meadow to survive in a harbor basin in the medium or long term.

In order to avoid all these phenomena, it is therefore advisable to:

- Use materials and construction techniques that minimize the suspension of fine particles that can induce turbidity in the surrounding waters. (for example: the dumping of fine materials (diameter less than 1 mm) at sea, or of blocks mixed with fine materials, is to be excluded completely; when rockfill is installed, it is advisable to rinse the blocks of rock; geotextile protective screens must be put in place around the site to minimize turbidity induced).

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

- Avoid the use of construction machines located at sea by favouring the use of machines lying on the ground. if it is essential to use them at sea, they must not be anchored or relied on *Posidonia* meadows.
- Avoid carrying out construction work in summer, when the plant rebuilds its reserves for the following year
- Build a new development at several tens of meters from the closest living *Posidonia* meadow
- Avoid constructions in areas covered with *Posidonia* meadows, as appropriate
- Monitor the condition of the surrounding seagrass, both during and at the end of the work.

(These elements on *Posidonia* meadows have been taken from: Boudouresque et al., 2006, Préservation des herbiers à *Posidonia oceanica*. RAMOGE pub.: 1-202, N°ISBN 2-905540-30-3)

Indicator units

- km^2 of impacted habitats

List of Guidance documents and protocols available

UNEP/MAP/PAP (2015). Guidance document on how to reflect changes in hydrographical conditions in relevant assessment (prepared by Spiteri, C.). Priority Actions Programme. Split, 2015.

UNEP(DEPI)/MED IG.22. UNEP(DEPI)/MED IG.22/Inf.7 (2016). Draft Integrated Monitoring and Assessment Guidance

UNEP(DEPI)/MED WG.433/1 (2017) PAP/RAC Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON) on Coast and Hydrography – Working Document

Advice document on hydrographical conditions (Descriptor 7) in the context of MSFD, published by OSPAR Commission (2012);

Scientific and technical review of the MSFD Commission Decision 2010/477/EU in relation to Descriptor 7 carried out by the EC JRC; etc.

Data Confidence and uncertainties

Data used or produced for the monitoring should be in agreement with Shared Environmental Information System (SEIS) principles. More on SEIS principles can be found in Draft Integrated Monitoring and Assessment Guidance.

Methodology for monitoring, temporal and spatial scope

Available Methodologies for Monitoring and Monitoring Protocols

At this stage, there is no clear available methodology and monitoring protocols (see **Known gaps and uncertainties in the Mediterranean).**

Some methodologies or protocols could be proposed, once done an inventory of existing and available data in Mediterranean Sea.

For more details, see “Guidance document on how to reflect changes in hydrographical conditions in relevant assessments“ (2015)

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

Available data sources

Global marine data source at the scale of the Mediterranean Sea:

- EMODnet Central Portal (http://www.emodnet.eu/)
- Mediterranean Marine Data (http://www.mediterranean-marinedata.eu/)
- Copernicus, Marine environment monitoring service (http://marine.copernicus.eu/)

Available regional or local data sources (in each country) should be also identified.

Spatial scope guidance and selection of monitoring stations

The monitoring will focus on habitats of interest, around new permanent constructions (lasting more than 10 years) in coastal waters.

The study area should depend on the footprint of the new construction considered and on the local (or regional) geographical and marine conditions. It should be large enough:

- to show all the hydrographic alterations induced by the construction, even for long term;
- to follow all the habitats of interest that could be potentially impacted.

It should be highlighted if monitoring was performed in sensitive areas, such as marine protected areas, spawning, breeding and feeding areas and migration routes of fish, seabirds and marine mammals, since they are priority.

Temporal Scope guidance

Contracting parties report every 6 years of all new permanent structures built during this reporting period.

Data analysis and assessment outputs

Statistical analysis and basis for aggregation

Expected assessments outputs

All the outputs that came out of the monitoring (I.e. trend analysis, distribution maps, etc.) should be listed, along with source(s) where they can be found.

The outputs to be reported are (map and GIS data):

- The area and location where the future structure will be built (footprint);
- The area and location of the habitats of interest potentially impacted by the structures (surrounding area of potentially affected habitats)

For the area and location where the future structure will be built, additionally to the surface representation of the structure, some information has to be provided as attributes of the GIS layer. The following attributes are proposed:

Country	*Locality / District*	*ID of the structure*	*Role of structure*	*Type of structure*	*Materials*	*Extend on the sea floor (in km^2)*
Specify the country	*Specify the location of the structure*	*The ID must be unique to identify the structure. It could be a number or a numbered code using letters from the previous column*	*Harbour, coastal defense, marine energy, ...*	*Quay, groynes, wind farm, ...*	*Concrete, rockfill, ...*	*Area of the structure on sea floor. The used unity has to be provided in the name of the field*

Ecological Objective 7	Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
Indicator Title	Location and extent of the habitats potentially impacted by hydrographic alterations

If the structure is composite (in terms of type, materials, ...), several GIS surface objects could be defined.

For the area and location of expected hydrographical alterations, additionally to the surface representation of these alterations, some information has to be provided as attributes of the GIS layer.

The following attributes are proposed:

Country	*Locality / District*	*ID of the structure*	*Nature of expected hydrographic alterations*	*Data used*	*Level of assessment confidence*	*Extend of hydrographical alteration (in km^2)*
Specify the country	*Specify the location of the structure*	*The ID must be unique to identify the structure. It could be a number or a numbered code using letters from the previous column*	*Waves/currents attenuation; anthropic changes of bathymetry; changes in sediment transit inducing erosion/sedimentation;*	*Data provided by EIA, SEA, MSP; dredging/disposal scheme, plan for extension of port/marina; ...*	*Low/Medium /Good*	*Area of the structure on sea floor (footprint) and its surrounding area as defined in the EIA, SEA, MSP.*

For each GIS data layer produced, a metadata file must be added. This file must provide information on: creation date of the GIS data, GIS data author, contact information, source agency, map projection and coordinate system, scale, error, explanation of symbology and attributes, data dictionary, data restrictions, and licensing (see for instance INSPIRE Directive).

Known gaps and uncertainties in the Mediterranean

There are general difficulties, not particular to the Mediterranean context, that can be identified for EO7:

- Lack of coherence in definitions, standard approaches in the development and application of indicators and in the assessment of impacts, together with lack of methodological standards.
- Lack of knowledge and understanding on the link between physical pressures and biological impacts and on the cumulative impacts.

Another difficulty comes from the hydrographical alterations that EO7 indicator should assess. These alterations, around a particular coastal construction, often change in intensity, in area and indeed in time, depending on the off-shore hydrographical conditions (calm weather/extreme event; seasonality of waves height and directions; local wind conditions…) and on the morphologic history of the site (the present state is due to the succession of these different conditions).

Contacts and version Date

Key contacts within UNEP for further information

Version No	**Date**	**Author**
V.1	27/6/16	PAP/RAC
V2	11/07/16	Olivier Brivois
V3	13/07/16	Olivier Brivois
V4	16/03/17	Olivier Brivois
V5	19/06/18	Olivier Brivois
V6	26/07/18	Olivier Brivois
V7	14/05/2025	PAP/RAC

Annex I: Reference list of habitats to be considered (Link to EO1)

Indicator guidance factsheet for EO8 Coastal Ecosystems and Landscapes Common Indicator 16 "Length of coastline subject to physical disturbance due to the influence of human-made structures"

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved	
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures	
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**
Physical disturbance to coastal areas induced by human activities should be minimized.	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved.	Negative impacts of human activities on coastal areas are minimized through appropriate management measures.
GES, targets and measures cannot be expressed quantitatively (as a threshold value) but due to country specific circumstances (socio-economic, cultural, historical) should be defined by the countries themselves. In doing so the CPs should take their spatial development and planning policies into account, as well as the legal obligations of the Barcelona Convention, in particular the ICZM Protocol. The Guidance document *"Assessment criteria and the Guiding document for application of assessment criteria for the IMAP Common Indicator 16"* was endorsed by the Meeting of the CORMON on Coast and Hydrography in 2023 and by the Decision IG.26/3 on Med 2023 QSR at CoP 23 (December 2023). It should be used to define GES, targets and for the assessment requirements. The above GES definition and Proposed target(s) are just examples.		
Rationale		
Justification for indicator selection Mediterranean coastal areas are particularly threatened by coastal development that modifies the coastline through the construction of buildings and infrastructure for residential, commercial, transport and tourist activities. The land, intertidal zone and near-shore estuarine and marine waters are increasingly altered by the loss and fragmentation of natural habitats and by the proliferation of a variety of built structures, such as ports, marinas, breakwaters, seawalls, jetties and pilings. These coastal human-made infrastructures cause irreversible damage to landscapes, losses in habitat and biodiversity, and strong influence on the configuration of the shoreline. Indeed, physical disturbance due to the development of artificial structures in the coastal fringe can disrupt the sediment transport, reduce the ability of the shoreline to respond to natural forcing factors, and fragment the coastal space. The modification of emerged beach and elimination of dune system contribute to coastal erosion phenomena by lessening the beach resilience to sea storms. Coastal defence infrastructures have been implemented to solve the problem together with beach nourishment but preserving the natural shoreline system with adequate sediment transport from river has proved to be the best solution. Monitoring the length of coastline subject to physical disturbance due to the influence of human-made structures and its trend is of paramount importance to preserve habitat, biodiversity and prevent coastal erosion phenomena, as well as for its importance in land-sea interactions. Until now there has not been systematic monitoring in Mediterranean regarding this, in particular not quantitatively based monitoring or any major attempt to homogenously characterize coastal ecosystems on a wider Mediterranean basis. The status assessment of EO8 aims to fill this gap.		
Scientific References Boak, E., H. & Turner I., L. (2005), Shoreline definition and detection: a review. Journal of Coastal Research 21(4), 688-703. Deichmann, U., Ehrlich, E., Small, E., and Zeug, G. (2011). Using high resolution satellite data for the identification of urban natural disaster risk (GFDRR (Global Facility for Disaster Reduction and Recovery)).		

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures

European commission and Directorate General Environment (2004a). Living with coastal erosion in Europe: Sediment and Space for Sustainability. A guide to coastal erosion management practices in Europe (The Netherlands: Eurosion project).

European commission and Directorate General Environment (2004b). Living with coastal erosion in Europe: Sediment and space for sustainability. Guidelines for incorporating coastal erosion issues into Environmental Assessment (EA) procedures (The Netherlands: Eurosion project).

Markandya, A., Arnold, S., Cassinelli, M., and Taylor, T. (2008). Protecting coastal zones in the Mediterranean: an economic and regulatory analysis. J. Coast. Conserv. 12, 145–159.

McLachlan, A., Brown, A.C., 2006. The Ecology of Sandy Shores. Academic Press, Burlington, MA, USA, 373 pp

Özhan, E. (2002). Coastal erosion management in the Mediterranean: an overview (Split: UNEP/MAP/PAP).

Rochette, J., Puy-Montbrun, G., Wemaëre, M., and Billé, R. (2010). Coastal setback zones in the Mediterranean: a study on Article 8-2 of the Mediterranean ICZM Protocol. n°05/10 December 2010, IDDRI

Sanò, M., Jiménez, J.A., Medina, R., Stanica, A., Sanchez-Arcilla, A., and Trumbic, I. (2011). The role of coastal setbacks in the context of coastal erosion and climate change. Ocean Coast. Manag. 54, 943–950.

UNEP/MAP/PAP (2001). White paper: coastal zone management in the Mediterranean. (Split).

UNEP/MAP (2013). Approaches for definition of Good Environmental Status (GES) and setting targets for the Ecological Objective (EO) 7 “Hydrography” and EO8 “Coastal ecosystems and landscape” in the framework of the Ecosystem Approach.

Policy Context and targets

Policy context description

ICZM Protocol (Article 8, point 3):

The Parties shall also endeavour to ensure that their national legal instruments include criteria for sustainable use of the coastal zone. Such criteria, taking into account specific local conditions, shall include, inter alia, the following:

(a) identifying and delimiting, outside protected areas, open areas in which urban development and other activities are restricted or, where necessary, prohibited;

(b) limiting the linear extension of urban development and the creation of new transport infrastructure along the coast;

(c) ensuring that environmental concerns are integrated into the rules for the management and use of the public maritime domain;

(d) providing for freedom of access by the public to the sea and along the shore;

(e) restricting or, where necessary, prohibiting the movement and parking of land vehicles, as well as the movement and anchoring of marine vessels, in fragile natural areas on land or at sea, including beaches and dunes.

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures

Targets

Negative impacts of human activities on coastal areas are minimized through appropriate management measures.

Additional country-specific criteria should be taken into account for definition of targets, measures and interpretation of results regarding this indicator due to strong socio-economic, historic and cultural dimensions in addition to characteristic geomorphological and geographical conditions in each respective country (reflected in policy documents, strategies and other country-specific documents). The interpretation of results should be left to the countries taking above criteria into account.

Policy documents

Protocol on the ICZM in the Mediterranean - http://www.pap-thecoastcentre.org/pdfs/Protocol_publikacija_May09.pdf

Indicator analysis methods

Indicator Definition

The monitoring aim of the EO8 common indicator is twofold: (i) to quantify the rate and the spatial distribution of the Mediterranean coastline artificialitsation and (ii) to provide a better understanding of the impact of those structures to the shoreline dynamics. It has an operational target on impact thus it is associated to concrete implementation measures related to specific human activities (i.e. appropriate management measures) to minimize negative impacts and to inform about progress towards GES.

Methodology for indicator calculation

The monitoring of this Common Indicator entails an inventory of the length and location of human-made coastline (hard coastal defence structures, ports, marinas (see Figure 1). Soft techniques e.g. beach nourishment are not included.

In addition, coastline is considered artificial only if landward structures intersect the reference coastline.

Archaeological remains are considered a separate category. Other human-made structures that do not fall into any established categories (e.g. parking lots, quarries, pilings, if not part of port and marinas, etc) are considered as 'Other'.

The off-shore breakwaters are projected to the reference coastline as artificial.

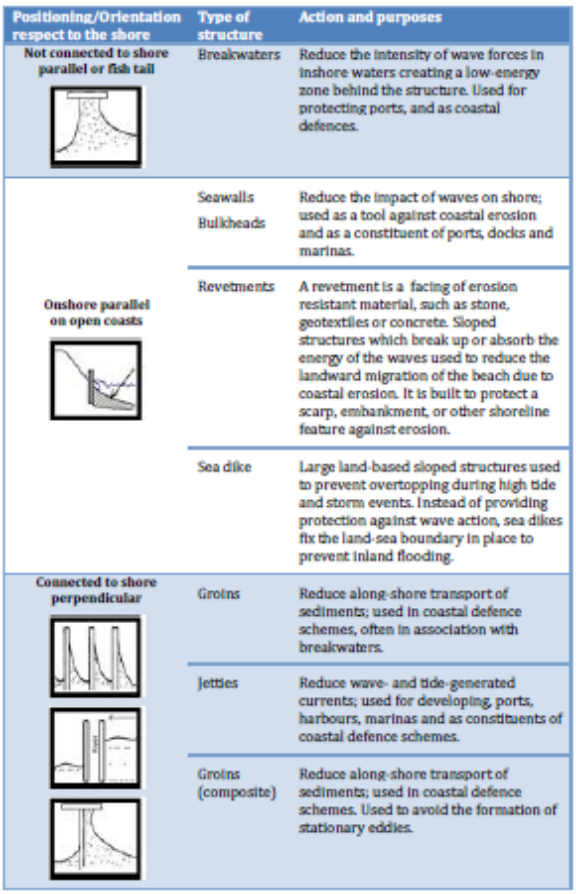
With regard to the coastline to be considered: the fixed reference official coastline as defined by responsible Contracting Party should be considered. The optimal resolution should be 5 m or 1: 2000 spatial scale.

Once a proper geographic scale has been established, monitoring should focus, in particular, on the location, the spatial extent and the types of coastal structures taking into account the minimum coastal length that can be classified as artificial or natural.

The identification procedure of human-made structures should be carried on based on typical situations added to the indicator guidance factsheet, including the minimum size (length, width of human-made structures) to be taken into account.

As monitoring should be done every 6 years, every CP should fix a reference year in the time interval 2000-2012 in order to eliminate the bias due to old or past human-made infrastructures.

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
Indicator Title	Length of coastline subject to physical disturbance due to the influence of human-made structures



Positioning/Orientation respect to the shore	Type of structure	Action and purposes
Not connected to shore parallel or fish tail	Breakwaters	Reduce the intensity of wave forces in inshore waters creating a low-energy zone behind the structure. Used for protecting ports, and as coastal defences.
Onshore parallel on open coasts	Seawalls Bulkheads	Reduce the impact of waves on shore; used as a tool against coastal erosion and as a constituent of ports, docks and marinas.
	Revetments	A revetment is a facing of erosion resistant material, such as stone, geotextiles or concrete. Sloped structures which break up or absorb the energy of the waves used to reduce the landward migration of the beach due to coastal erosion. It is built to protect a scarp, embankment, or other shoreline feature against erosion.
	Sea dike	Large land-based sloped structures used to prevent overtopping during high tide and storm events. Instead of providing protection against wave action, sea dikes fix the land-sea boundary in place to prevent inland flooding.
Connected to shore perpendicular	Groins	Reduce along-shore transport of sediments; used in coastal defence schemes, often in association with breakwaters.
	Jetties	Reduce wave- and tide-generated currents; used for developing, ports, harbours, marinas and as constituents of coastal defence schemes.
	Groins (composite)	Reduce along-shore transport of sediments; used in coastal defence schemes. Used to avoid the formation of stationary eddies.

Figure 1. Hard coastal defence structures, modified from the EUROSION Shoreline Management Guide, EU, 2004. Taken from IMAP guidelines, page 134, Table 1.

Indicator units

- Km of artificial coastline and % of total length of coastline.
- Percentage (%) of natural coastline on the total coastline length.

The length of artificial coastline should be calculated as the sum of segments on reference coastline identified as the intersection of polylines representing human-made structures with reference coastline ignoring polylines representing human-made structures with no intersection with reference coastline. The minimum distance between coastal defence structures should be set to 10 m in order to classify such segments as natural, i.e. if the distance between two adjacent coastal defence structures is less than 10 m, all the segments including both coastal defence structures is classified as artificial.

List of Guidance documents and protocols available

Monitoring and assessment methodological guidance on EO8: coastal ecosystems and landscapes (within IMAP guidelines)

EUROSION Shoreline Management Guide (European Commission and Directorate General Environment, 2004, Annex 2)

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Data Confidence and uncertainties

Regarding data confidence, both geographic scale and resolution of images have to be properly selected depending on type and density of coastal human-made structures. A specific cost/benefit analysis has to be carried on choosing the right balance among resolution, an acceptable level of uncertainties and the necessity to assure comparability of results at Mediterranean level.

Methodology for monitoring, temporal and spatial scope

Available Methodologies for Monitoring and Monitoring Protocols

Space and airborne earth observation systems are the most suitable tool to conduct the monitoring strategy of the EO8 common indicator, i.e. very high resolution (VHR) satellite imagery, aerial photographs, laser scanners etc. Beyond earth observation data, identification techniques and procedures used through GIS tools also have to be described**.**

Available data sources

CORINE land cover, national spatial plans, World Imagery Basemap feature (in ArcGIS 10.1), Landsat satellite imagery, Google earth, aerial photographs surveys.

Spatial scope guidance and selection of monitoring stations

The exact territorial extent of the monitoring should be presented.

The optimum spatial scale for a proper identification of human-made structures should be 5 m by satellite imagery or aerial photographs.

Temporal Scope guidance

Monitoring human-made structures data should be updated at least every 6 years, while shoreline survey of sandy coastline under anthropogenic pressure should be, if possible, repeated annually (at the same time of the year).

Data analysis and assessment outputs

Statistical analysis and basis for aggregation

The total length of coastline estimated as being subjected to physical disturbance due to the influence of human-made structures should be summed up. In addition, the share of this coastline in total country's coastline should be determined. If an official coastline is available, i.e. an institutional body provides a GIS polyline, then such coastline can be used to “project” the identified human-made structures in order to classify parts of the coastline as being subjected to physical disturbance due to the influence of human-made structures. Geographic scale of maps and cartography used to identify human-made structures could be different but not too much form the ones used for the official coastline. In case if such official coastline is not available or its geographic scale is too coarse with respect to one needed to properly identify human-made structures, then coastline will be defined by the same maps/cartography used for human-made structures identification.

Expected assessments outputs

The total length of coastline influenced by human-made structures and the share of this coastline in total country’s coastal length should be provided on a map showing the coastline subject to physical disturbance due to human-made structures (artificial segments) in red line and the rest (natural segments) in green line.

The assessment output should be reported as a common shape file format with GRS as WGS84.

Shapefiles with other GRS will also be accepted if provided with a complete .prj file that allows GRS transformations by standard GIS tools.

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Known gaps and uncertainties in the Mediterranean

In order to implement EO8 indicator with an acceptable level of accuracy, recent data sources with proper spatial resolution and complete coastline coverage should be used jointly with adequate GIS tools and expert team.

Capacity building can be readily assessed for each CP as such resources are generally available for the Mediterranean Region also taking into account the increasing efforts on satellite imagery products (ESA Sentinels constellation). So, once a common framework of data sources, GIS procedures and way of representing the output of EO8 indicator are agreed, a common implementation work for all CPs could be in principle settled down.

Contacts and version Date

Key contacts within UNEP/MAP for further information

Version No	Date	Author
V.1	27/6/16	PAP/RAC & Giordano Giorgi
V.2	27/7/16	Giordano Giorgi
V.3	23 March 2018	PAP/RAC
V.4	15/04/2025	PAP/RAC