

Guidance Factsheet for Common Indicator 16

Adopted at MAP FPs meeting (16-19 September 2025, Athens)

Guidance factsheet for Common Indicator 16

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 “ <i>Assessment criteria and the Guiding document for application of assessment criteria for the IMAP Common Indicator 16</i> ” was endorsed by the Meeting of the CORMON on Coast and Hydrography in 2023 (UNEP/MAP WG.549/6) 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)).		
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).		

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 (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.	
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	

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
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 artificialisation 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																						
<table><tr><th>Positioning/Orientation respect to the shore</th><th>Type of structure</th><th>Action and purposes</th></tr><tr><td>Not connected to shore parallel or fish tail </td><td>Breakwaters</td><td>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.</td></tr><tr><td rowspan="3">Onshore parallel on open coasts </td><td>Seawalls Bulkheads</td><td>Reduce the impact of waves on shore; used as a tool against coastal erosion and as a constituent of ports, docks and marinas.</td></tr><tr><td>Revetments</td><td>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.</td></tr><tr><td>Sea dike</td><td>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.</td></tr><tr><td rowspan="3">Connected to shore perpendicular   </td><td>Groins</td><td>Reduce along-shore transport of sediments; used in coastal defence schemes, often in association with breakwaters.</td></tr><tr><td>Jetties</td><td>Reduce wave- and tide-generated currents; used for developing ports, harbours, marinas and as constituents of coastal defence schemes.</td></tr><tr><td>Groins (composite)</td><td>Reduce along-shore transport of sediments; used in coastal defence schemes. Used to avoid the formation of stationary eddies.</td></tr></table>				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.
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)																							

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
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 from 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.	

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	
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