



UNITED  
NATIONS

**EP**

UNEP/MED WG.471/4



UNEP



UNITED NATIONS  
ENVIRONMENT PROGRAMME  
MEDITERRANEAN ACTION PLAN

19 April 2019  
Original: English

---

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

Rome, Italy; 21-22 May 2019

**Agenda item 3: EO8 Coastal Ecosystems and Landscapes: Common Indicator 16 “Length of  
coastline subject to physical disturbance due to the influence of manmade structures”**

Proposed amendments of the indicator guidance factsheet; and proposed Data Standards

For environmental and economic reasons, this document is printed in a limited number. Delegates are kindly requested to bring their copies to meetings and not request additional copies.

## Contents

<b>Note by the Secretariat .....</b>	<b>3</b>
<b>1. Indicator guidance factsheet for EO8 Coastal Ecosystems and Landscapes Common Indicator 16 “Length of coastline subject to physical disturbance due to the influence of manmade structures” .....</b>	<b>4</b>
<b>2. Information standards for the Common Indicator 16 .....</b>	<b>10</b>

### **Note by the Secretariat**

The 19th Meeting of the Contracting Parties (COP 19), held in February 2016, adopted the Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (Decision IG. 22/7), with a list of regionally agreed good environmental status descriptions, common indicators and targets, with principles and clear timeline for its implementation. Furthermore, the UN Environment/MAP Programme of Work (PoW) adopted at COP 19, included under Output 1.4.3: “Implementation of IMAP (the EcAp-based integrated monitoring and assessment programme) coordinated, including GES common indicators factsheets”. In line with IMAP, indicator guidance actsheets were developed, reviewed and agreed by the Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CorMon) on Coast and Hydrography held in Madrid, Spain, 3 March 2017 and by the Meeting of the PAP/RAC Focal Points, held in Split, Croatia, 3-4 May 2017, for the Common Indicators to ensure coherent monitoring. The indicator guidance factsheets provide concrete guidance to the Contracting Parties supporting implementation of their respective national monitoring programmes aligned with IMAP. The comments received by the Contracting Parties were considered and approved by the 6th Meeting of the Ecosystem Approach Coordination Group, held in Athens, Greece, 11th September 2017. It must be noted that the indicator guidance factsheets were used during the elaboration of the Mediterranean Quality Status Report 2017 (Med QSR 2017).

The present document outlines the guidance Factsheet for the Common Indicator (CI) 16 related to the Ecological Objective 8 (Coastal Ecosystems and Landscapes). Specific points to discuss are the amendments of the indicator guidance factsheet, proposed by some contracting parties on several occasions: e.g. PAP/RAC Focal Points meeting (May 2017, Split, Croatia); at Sub-regional meeting on Coast and Hydrography (December 2017 in Zagreb, Croatia), and finally in comments on QSR assessment factsheets. These amendments mostly relate to the revision of Methodology for indicator calculation, i.e. removal of “the impervious surface in the coastal fringe (100m from the coastline).” This element will be taken into account with the candidate common indicator on Land use change. In addition, the title of the indicator will be proposed to be changed: from “Length of coastline subject to physical disturbance due to the influence of manmade structures” to “Length of coastline subject to physical disturbance due to the influence of human-made structures”, to be gender-neutral.

Within the EU funded EcAp-MED II Project the development of a Pilot IMAP Compatible Data and Information System (IMAP (Pilot) Info System) was supported. This (Pilot) Info System will enable the CPs to have a harmonised framework for reporting on monitoring for the IMAP indicators, i.e they will be able to receive and process data according to the proposed Data Standards (DSs) and Data Dictionaries (DDs) that set the basic information on data reporting within IMAP. The first drafts of DSs and DDs for the selected IMAP Common Indicators were reviewed by the Regional Meeting on IMAP Implementation: Best Practices, Gaps and Common Challenges (IMAP Best Practices Meeting), Rome, Italy, 10-12 July 2018. The final draft of the DSs and DDs for the CI 16 will be presented by Info/RAC and a discussion will follow. The meeting is expected to review and acknowledge the proposed DSs and DDs for the CI 16.

## 1. Indicator guidance factsheet for EO8 Coastal Ecosystems and Landscapes Common Indicator 16 “Length of coastline subject to physical disturbance due to the influence of manmade structures”

Ecological Objective 8: The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved

<b>Indicator Title</b>	Length of coastline subject to physical disturbance due to the influence of <del>human-man</del> made structures	
<b>Relevant GES definition</b>	<b>Related Operational Objective</b>	<b>Proposed Target(s)</b>
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.
<b>Rationale</b>		
<b>Justification for indicator selection</b>		
<p>Mediterranean coastal areas are particularly threatened by coastal development that modifies the coastline through the construction of buildings and infrastructure needed to sustain 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 <del>humanman</del>-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.</p> <p>Monitoring the length of coastline subject to physical disturbance due to the influence of <del>human</del>-made structures and its trend is of paramount importance to preserve habitat, biodiversity and prevent coastal erosion phenomena, <u>as well as for its importance in land-sea interactions</u>. Until now there has not been systematic monitoring in Mediterranean regarding this, in particular not quantitatively based monitoring or any major attempt to homogeneously characterize coastal ecosystems on a wider Mediterranean basis. The status assessment of EO8 aims to fill this gap.</p>		
<b>Scientific References</b>		
<p>Boak, E., H. &amp; Turner I., L. (2005), Shoreline definition and detection: a review. <i>Journal of Coastal Research</i> 21(4), 688-703.</p> <p>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)).</p> <p>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).</p> <p>European commission and Directorate General Environment (2004b). Living with coastal erosion in</p>		

<b>Indicator Title</b>	Length of coastline subject to physical disturbance due to the influence of <del>human-man</del> made structures
<p>Europe: Sediment and space for sustainability. Guidelines for incorporating coastal erosion issues into Environmental Assessment (EA) procedures (The Netherlands: EuroSION project).</p> <p>Markandya, A., Arnold, S., Cassinelli, M., and Taylor, T. (2008). Protecting coastal zones in the Mediterranean: an economic and regulatory analysis. <i>J. Coast. Conserv.</i> 12, 145–159.</p> <p>McLachlan, A., Brown, A.C., 2006. <i>The Ecology of Sandy Shores</i>. Academic Press, Burlington, MA, USA, 373 pp</p> <p>Özhan, E. (2002). Coastal erosion management in the Mediterranean: an overview (Split: UNEP/MAP/PAP).</p> <p>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</p> <p>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. <i>Ocean Coast. Manag.</i> 54, 943–950.</p> <p>UNEP/MAP/PAP (2001). White paper: coastal zone management in the Mediterranean. (Split).</p> <p>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.</p>	
<b>Policy Context and targets</b>	
<p><b>Policy context description</b></p> <p>ICZM Protocol (Article 8, point 3):</p> <p>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:</p> <ul style="list-style-type: none"> <li>(a) identifying and delimiting, outside protected areas, open areas in which urban development and other activities are restricted or, where necessary, prohibited;</li> <li>(b) limiting the linear extension of urban development and the creation of new transport infrastructure along the coast;</li> <li>(c) ensuring that environmental concerns are integrated into the rules for the management and use of the public maritime domain;</li> <li>(d) providing for freedom of access by the public to the sea and along the shore;</li> <li>(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.</li> </ul>	
<p><b>Targets</b></p> <p>Negative impacts of human activities on coastal areas are minimized through appropriate management measures.</p> <p><u>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</u></p>	

<b>Indicator Title</b>	Length of coastline subject to physical disturbance due to the influence of <u>human-made</u> structures
<u>dimensions in addition to characteristic geomorphological and geographical conditions in each respective country (reflected in policy documents, strategies and other country-specific documents). Interpretation of results should be left to the countries taking above criteria into account.</u>	
<b>Policy documents</b> Protocol on the ICZM in the Mediterranean - <a href="http://www.pap-thecoastcentre.org/pdfs/Protocol_publicacija_May09.pdf">http://www.pap-thecoastcentre.org/pdfs/Protocol_publicacija_May09.pdf</a>	
<b>Indicator analysis methods</b>	
<b>Indicator Definition</b>  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.	
<b>Methodology for indicator calculation</b>  The monitoring of this Common Indicator entails an inventory of :  (i) the length and location of <u>human-made</u> coastline (hard coastal defence structures, ports, marinas (see Figure 1). Soft techniques e.g. beach nourishment are not included; and (ii) land claim, i.e. the surface area reclaimed from the 1980's onward (ha). <del>(iii) the Impervious surface in the coastal fringe (100m from the coastline).</del>	
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 <u>human-made</u> structures should be carried on based on typical situations added to the indicator guidance factsheet, including the minimum size (length, width of <u>human-made</u> 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 <u>human-made</u> infrastructures.	

**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
<b>Not connected to shore parallel or fish tail</b> 	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.
<b>Onshore parallel on open coasts</b> 	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.
<b>Connected to shore perpendicular</b>   	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 segment 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)

**Data Confidence and uncertainties**

<b>Indicator Title</b>	Length of coastline subject to physical disturbance due to the influence of <u>human-made</u> structures
<p>Regarding data confidence, both geographic scale and resolution of images have to be properly selected depending on type and density of coastal <u>human-made</u> structures. A specific cost/benefit analysis has to be carried on to choose the right balance among resolution, an acceptable level of uncertainties and the necessity to assure comparability of results at Mediterranean level.</p>	
<b>Methodology for monitoring, temporal and spatial scope</b>	
<b>Available Methodologies for Monitoring and Monitoring Protocols</b>	
<p>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</p>	
<b>Available data sources</b>	
<p>CORINE land cover, national spatial plans, World Imagery Basemap feature (in ArcGIS 10.1), Landsat satellite imagery, Google earth, aerial photographs surveys.</p>	
<b>Spatial scope guidance and selection of monitoring stations</b>	
<p>The exact territorial extent of the monitoring should be presented. The optimum spatial scale for a proper identification of <u>human-made</u> structures should be 5 m by satellite imagery or aerial photographs.</p>	
<b>Temporal Scope guidance</b>	
<p>Monitoring <u>human-made</u> structures data should be updated at least every 6 years, while shoreline survey of sandy coastline under <u>manmade-anthropogenic</u> pressure should be, <u>if possible</u>, repeated annually (at the same time of the year)</p>	
<b>Data analysis and assessment outputs</b>	
<b>Statistical analysis and basis for aggregation</b>	
<p>The total length of coastline estimated as being subjected to physical disturbance due to the influence of <u>human-made</u> structures should be summed. 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 <u>human-made</u> structures in order to classify parts of the coastline as being subjected to physical disturbance due to the influence of <u>human-made</u> structures. Geographic scale of maps and cartography used to identify <u>human-made</u> 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 <u>human-made</u> structures, then coastline will be defined by the same maps/cartography used for <u>human-made</u> structures identification.</p>	
<b>Expected assessments outputs</b>	
<p>The total length of coastline influenced by <u>human-made</u> 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 <u>human-made</u> 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. Shape file with other GRS will also be accepted if provided with a complete .prj file that allows GRS transformations by standard GIS tools.</p>	

<b>Indicator Title</b>	Length of coastline subject to physical disturbance due to the influence of <del>human-man</del> made structures	
<b>Known gaps and uncertainties in the Mediterranean</b>		
<p><u>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.</u></p> <p><u>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 settle down.</u></p>		
<b>Contacts and version Date</b>		
<b>Key contacts within UNEP/MAP for further information</b>		
<b>Version No</b>	<b>Date</b>	<b>Author</b>
V.1	27/6/16	PAP/RAC & Giordano Giorgi
V.2	27/7/16	Giordano Giorgi
v.3	23 March 2018	PAP/RAC

## 2. Information standards for the Common Indicator 16

GIS information standards:

- Artificial structures
- Coastline artificial/natural

**Name of GIS layer:** Artificial\_structures

**Type of GIS Layer:** polyline

**Geographical Reference Systems:** WGS 84 decimal degree

**Attribute table:**

Content	Description
<b>Ecological Objective</b>	<b>EO8. Coastal ecosystem and landscape</b>
<b>IMAP Common Indicator</b>	<b>CI16. Length of coastline subject to physical disturbance due to the influence of manmade structures</b>
<b>Parameter</b>	<b>Location and extend of artificial structures</b>
Attribute table	<p>Specify the following information in the attribute table associated with the GIS information layer:</p> <ul style="list-style-type: none"> <li>• CPCODE: Two-letter code of Country</li> <li>• ASCODE: Mandatory. Integer. Code of type of artificial infrastructure. The following code list should be used: <ul style="list-style-type: none"> <li>○ 1 Breakwaters</li> <li>○ 2 Seawater/Revetments/Sea dike</li> <li>○ 3 Groins</li> <li>○ 4 Jetties</li> <li>○ 5 River mouth structures</li> <li>○ 12 Port and marinas</li> <li>○ 21 Land reclamation</li> </ul> </li> <li>• ASDES: Optional. Text. Description of type of artificial infrastructures</li> <li>• Municipal: Optional. Text. Name of municipality or local administrative region where the polygon of impervious surface is located</li> <li>• Year: Mandatory. Text. Year of production of the information layer</li> </ul>
Variables	Border on the sea side of coastal artificial structures
Spatial resolution	10 m or higher as produced by photo digitalization or CAD (Computer Aided Design) software
Vertical coverage	1 level at sea surface
Coordinate Reference System	WGS 84 or ETRS 89 decimal degrees
Temporal coverage	Every 6 years
Data format	GIS Layer: polyline or polygon

**Name of GIS layer:** Coastline\_AN

**Type of GIS Layer:** polyline

**Geographical Reference Systems:** WGS 84 decimal degree

**Attribute table:**

Content	Description
Ecological Objective	<b>EO8. Coastal ecosystem and landscape</b>
IMAP Common Indicator	<b>CI16. Length of coastline subject to physical disturbance due to the influence of manmade structures</b>
Parameter	<b>Artificial/Natural coastline</b>
Attribute table	<p>Specify the following information in the attribute table associated with the GIS information layer:</p> <ul style="list-style-type: none"> <li>• CPCODE: Two-letter code of Country</li> <li>• ART_NAT: Mandatory. Integer. Code for type of segment of coastline. Use the following code list: <ul style="list-style-type: none"> <li>○ 0 Natural coastline</li> <li>○ 1 Artificial coastline</li> </ul> </li> <li>• Municipal: Optional. Text. Name of municipality or local administrative region where the polygon/polyline of segment of coastline is located</li> <li>• Year: Mandatory. Text. Year of production of the information layer</li> <li>• Ref_Year: Mandatory. Year of the reference coastline used to represent natural and artificial segments</li> </ul>
Variables	Segment of artificial/natural of coastline
Spatial resolution	10 m or higher as produced by photo digitalization and interpretation
Vertical coverage	1 level at sea surface
Coordinate Reference System	WGS 84 or ETRS 89 decimal degrees
Temporal coverage	Every 6 years
Data format	GIS Layer: polyline