EO8 Coastal Ecosystems and Landscapes Common Indicator 16-Length of coastline subject to physical disturbance due to the influence of human-made structures – Egypt

Prepared by

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April, 2022

TITLE

Length of coastline subject to physical disturbance due to the influence of human-made structures – Egypt

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PLACE AND DATE

Alexandria, Egypt in April, 2022

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of the author and do not necessarily reflect the views of the European Union

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Executive Summary

While coastline customarily experience changes and adaptation, yet anthropogenic interference and excessive developments adversely affecting the naturally harmonized system, causing disturbance and threat to sustainability. Additionally, the growing concerns on Climate Change and Sea Level Rise (SLR) trigger new challenge to coastal zones. International actions have been initiated for getting prepared; and work with a holistic cooperative perspective. within the framework of the Integrated Coastal Zone Management rationale for protecting and improving the Mediterranean Sea coastal environment, this report objective is to present results for the EO8 Coastal Ecosystems and Landscapes Common Indicator 16 “Length of coastline subject to physical disturbance due to the influence of human-made structures” along the Egyptian northern coastline. Characteristics of the Egyptian coastline with the Mediterranean Sea are presented in accordance with stipulated fact sheets, information standards and UNEP/MED documentations.

The report starts with a brief background about the study area, followed by the methodology applied to establish classified coastline. Within the result section, the report also discusses aspects of the variability in purposes for the evolving human interference and intensive protection structures, through two case studies in Egypt; Alexandria city and Rosetta promontory. These exemplar case studies represent two different causes for protection works; safeguarding developed infrastructure, investments and leisure activities, and stopping land loss caused by upstream hydraulic structures located hundreds of kilometers inland, respectively.

Introduction

Coastal zone is usually a vivid environment, and subject to changes and fluctuations in meteorological and hydrodynamic behavior. However, the capacity of ecosystem sustainability and biodiversity adjustability are obstructed by anthropogenic intervention; increasing needs and over exploiting with growing populations. furthermore, the challenge of reaching sustainability level while pushing ahead the development wheel is now facing an extra dimension to consider; Climate Change impact.

Growing concerns of consequences of Climate Change and potential Sea Level Rise (SLR) on the coastal areas prompted common interest of the international community. Actions have been initiated for getting prepared and work with a cooperative sense. within the framework of the Integrated Coastal Zone Management rationale for protecting and improving the Mediterranean Sea coastal environment, this report objective is to present results for EO8 Coastal Ecosystems and Landscapes Common Indicator 16 “Length of coastline subject to physical disturbance due to the influence of human-made structures” along the Egyptian northern coastline. Findings are provided in accordance with stipulated fact sheets, information standards and UNEP/MED documentations (annexes)

The outputs of this work include:

➢ Narrative Report of the main characteristics of the Egyptian coastline with the Mediterranean Sea; classified into main indicator units:

- O Km of artificial coastline as % of total length of coastline.
- O Km of natural coastline as % of total length of coastline.

➢GIS layer (polyline; WGS 84 decimal degree): Artificial structures with location and extend of artificial structures, with attribute table; in a format suitable for upload directly to IMAP Info system coordinated by INFO/RAC

➢ GIS layer: Coastline-AN: Artificial/Natural coastline with attribute table.

Beside the baseline degree of the anthropogenic effect, and pattern of presence and absence of coastal structures, the report shed some light on trends of progressive alteration. With exemplar case studies, a discussion is presented for purpose of demonstrating the variability in causes for protection works; safeguarding developed infrastructure and investments, in one hand, and stopping land loss and retreat in the other

Earth Observation techniques, satellite imagery processing in GIS environment, have been used to establish coastline classification in relation to protection structure versus natural zones.

Study Area

Egypt is located in the North East of Africa; and fortunate with Northern coastline with the Mediterranean Sea and Eastern coastline with the Red Sea (Figure 1). The Mediterranean coastline north of Egypt extends for more than 1000km and hosts five coastal lakes, mouths of two main branches of the Nile River, as well as active

socioeconomic hotspots, and trade routes and ports. Shoreline stretch varies from populated/developed to less populated; and rocky to sandy. Northern coastal zone in Egypt witnesses progressive developments, yet with different rate and intensity. Accordingly, a growing concentration of population is tightly related to increased human activities, investments, and infrastructure.

As a semi arid country, most of the developments in Egypt are closely related to the Nile Valley and Delta. Therefore, the Nile Delta is densely populated and has special socioeconomic importance; with agri-industrial activities, urbanization and established infrastructure. Further, the Delta coastal region has a special ecological status, with acknowledged nature reserve lakes that are rich with aquatic biota and key host to migratory birds (Abayazid, 2017).

Figure 1: Egypt: Nile, Delta and Coastlines

Coastline of the Delta has been largely related to flooding behavior of the river. However, the Nile Delta has experienced remarkable shift, particularly with land retreat and erosion, as a result of dramatic reduction in sediment supply from the Nile after upstream stream regulating constructions, e.g., barrages, High Dam. That fact highlights the reason for certain extensive protection response in the Delta region.

Method & Materials

Satellite Imagery & Processing

The imageries used in this application, in order to define the Northern Egyptian coastline characteristics, are the Sentinel-2 Earth Observation mission from the Copernicus programme of the European commission (ESA). The selected tiles that cover the study area are illustrated in figure (2). The spectral bands with high spatial resolution (10m) have been used, namely, (Band 3, Band 4 and Near-Infrared Band 8). Also, different dates have been consulted for better shoreline detection. Results with imageries acquired in the season August/September of (2021) have been verified with imageries of recent acquisition dates (February/March2022).

In application, satellite image enhancement procedures have been applied. Also consulted are the developed Normalized Difference Water Index" (NDWI) for each tile within the study area.
The NDWI processing gives water distinctive feature and is calculated with reference to the Green and Near-Infrared spectral area;

$$NDWI = \frac{\text{Green Band} - \text{NIR Band}}{\text{Green Band} + \text{NIR Band}} \qquad \text{Equation (1)}$$

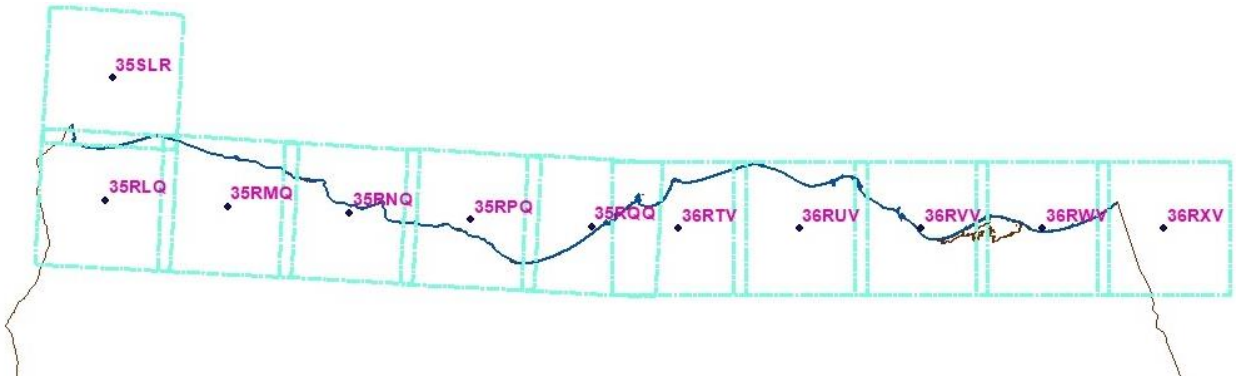

Figure 2: Sentinel-2 imageries, and tile codes, covering the northern coastline of Egypt

Landsat imageries have been used in order to follow historical changes, since the 1970's, to Rosetta River mouth as well as the progressive protection developments recently witnessed in certain regions (e.g., Alexandria western sector).

Map calculations, statistical analysis and result display have been carried out in the GIS environment.

The information in the attribute table associated with the GIS information layer, according to the information standards for the Common indicator 16, for the coastline of Egypt are:

- CPCODE: (Two-letter code of Country) EG
- ART_NAT: Code for type of segment of coastline.
    - 0 Natural coastline
    - 1 Artificial coastline
- ASCODE: Code of type of artificial infrastructure.
    - 1 Breakwaters
    - 2 Seawall/Revetments/Sea dike
    - 3 Groins
    - 4 Jetties
    - 5 River mouth structures
    - 12 Port and marinas
- Year: Year of production of the information layer
- Length :(Length of coastline segment in km, calculated through Arcmap)

Results

Main Findings

Total length of the Egyptian coastline is approximately 1110km. The natural part of the Egyptian coast represents 84.2% of the total coast, with a length of about 935km, and the artificial coastline represents 15.8% with a length of about 175.1km (Figure 3 and Table 1). It is worth mentioning that 80% of the artificial length is found in the Nile Delta coastal zone, with aggregated length around 140Km.

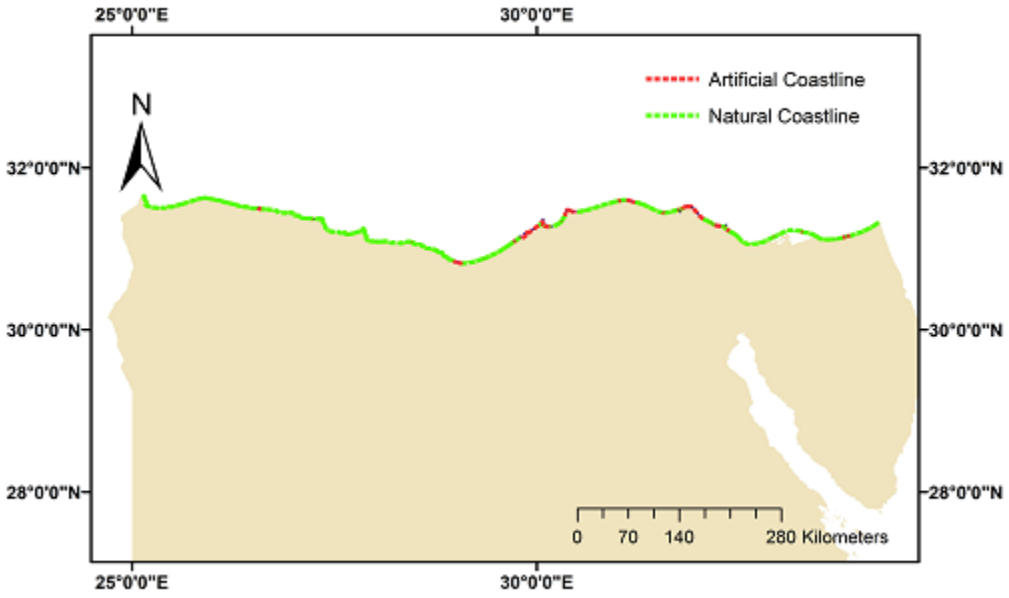

Figure 3: Spatial Coastline Classification - North of Egypt

Table 1: Classified Coastline - North of Egypt

Type	Length (Km)	Percentage (%)
Natural Coastline	934.83	84.2
Artificial Coastline	175.13	15.8
Total	1109.96	100

Main purposes for protection works include shoreline stability, slowing/stopping erosion, controlling sediment transport, alleviate sedimentation/ siltation at port/harbor entrances, river/drain mouths, and lake inlets, and creating tranquil bathing environment.

While main concentration of the protection works is found in the Nile Delta coast, the sector west to the Delta, however, has been witnessing continuous progress and protection establishments, with booming Beach resort industry, increasing trend of urbanization, and potential expansion in agriculture reclamation out of the Delta boundary. Figures (4a to 4f) show examples of protection efforts in western coastal sector till Marsa Matrouh.

Figure 4a: Examples protection works in western coastal sector till Marsa Matrouh

Figure 4b: Examples protection works in western coastal sector till Marsa Matrouh

Figure 4c: Examples protection works in western coastal sector till Marsa Matrouh

Figure 4d: Examples protection works in western coastal sector till Marsa Matrouh

Figure 4e: Examples protection works in western coastal sector till Marsa Matrouh

Figure 4f: Examples protection works in western coastal sector till Marsa Matrouh

Figure 4g: Examples protection works in western coastal sector till Marsa Matrouh

The least intensity of anthropogenic interference and protection structures is found in the eastern sector of the Egyptian northern coast.

Detached breakwaters, while not physically intersect with the shoreline, yet change the shore feature and sediment behavior and, therefore, considered artificial section of the coastline

Groins set/groups and segments in between are considered artificial, as their existence change the behavior of the shoreline erosion and accretion/sedimentation. Accordingly, the whole segment was considered artificial.

Protection structures that coincide with harbors/ports or tourism Marinas were classified as Port and Marinas (ASCODE 12)

Alexandria versus Rosetta

For purpose of demonstration, a brief comparison is presented of human intervention in response to property safeguard. these exemplar case studies represent two different reasons initiating protection works; safeguarding developed infrastructure and investments, and stopping land loss caused by upstream inland hydraulic structures.

Rosetta promontory have experienced severe geomorphologic changes as a result of human interference that started long way south, with Nile River upstream hydraulic structures. Consequently, the Rosetta promontory has been severely retreated due to

the obstructed sediment delivery after that series of rive r regulating constructions along the Nile, especially the Aswan High Dam (Abo Zed and Shereet, 2005). Shoreline changes of Rosetta promontory from 1972 till 2021 is demonstrated in figure (5). Currently, the Rosetta promontory stability and retreat alleviation is secured by long Seawalls and sets of groins.

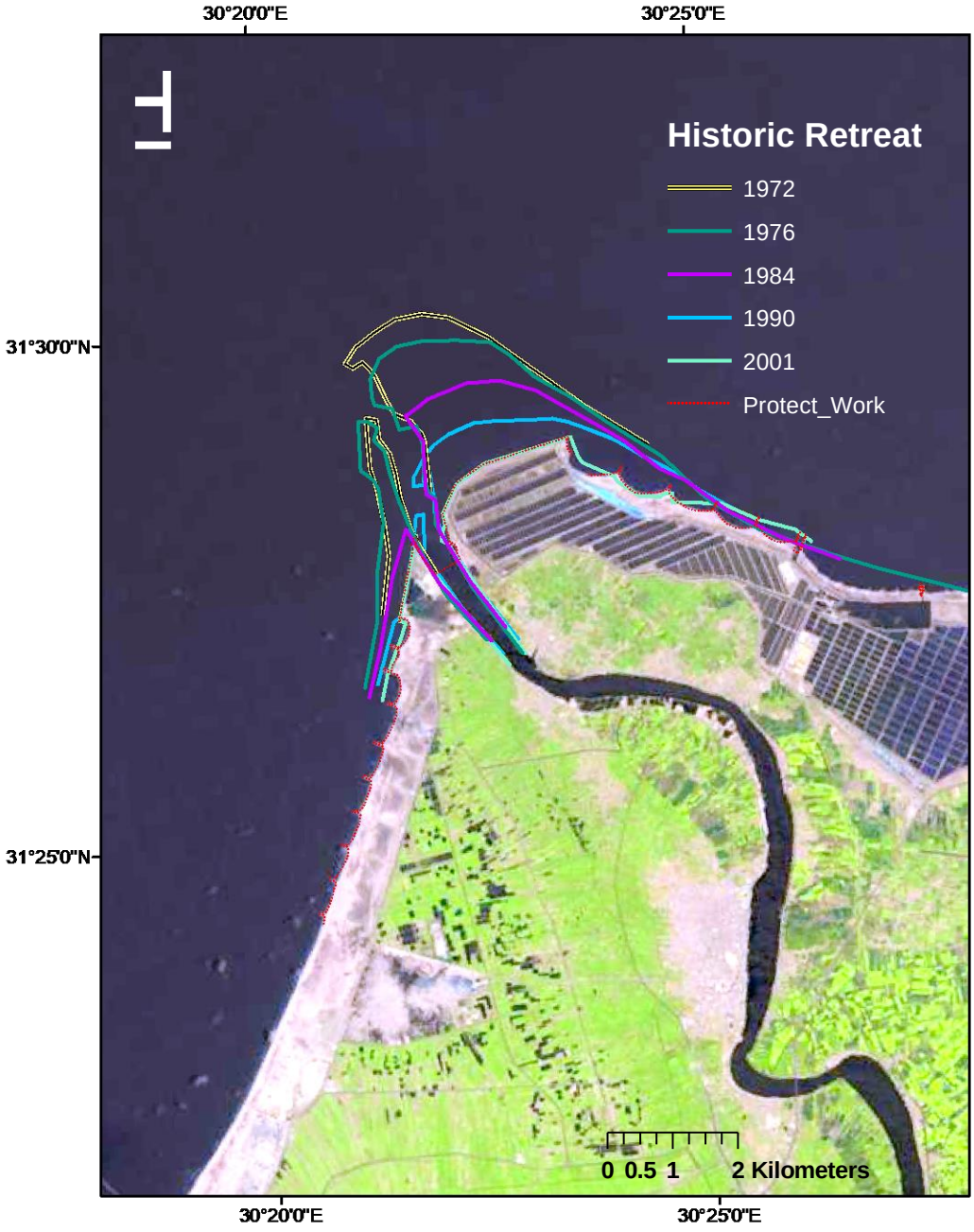

Figure 5: Historic retreat in Rosetta promontory before protection structures

Alexandria is located on the west side of the Nile Delta and considered a principal recreational seaside city. It plays an essential role in the Egyptian economy, with tourism and port activities (five harbors: three commercial harbors: and two fishing harbors). Furthermore, Alexandria hosts about 40% of Egypt industries, and acquires special cultural status, with its rich heritage and internationally acknowledged library (Abayazid et al., 2016). However, to meet the growing demands of the city, Alexandria has been witnessing large-scale multi-phased construction projects with extensive coastal structures. Along Alexandria coastline, a sequence of hard engineering structures is found, e.g., coastal highway sea wall, detached breakwaters groins, submerged breakwater, jetties...etc. Hence, an inevitable change in coastal hydrodynamic, physio-chemical and sediment transport behavior have been created, causing further disturbance to shoreline stability (Abayazid et al., 2016). Figure (6) illustrates aspect of the progressive development and extended constructions in Alexandria coastal strip during the last decades, while figures (7a to 7d) show example of protection structures along Alexandria coastline.

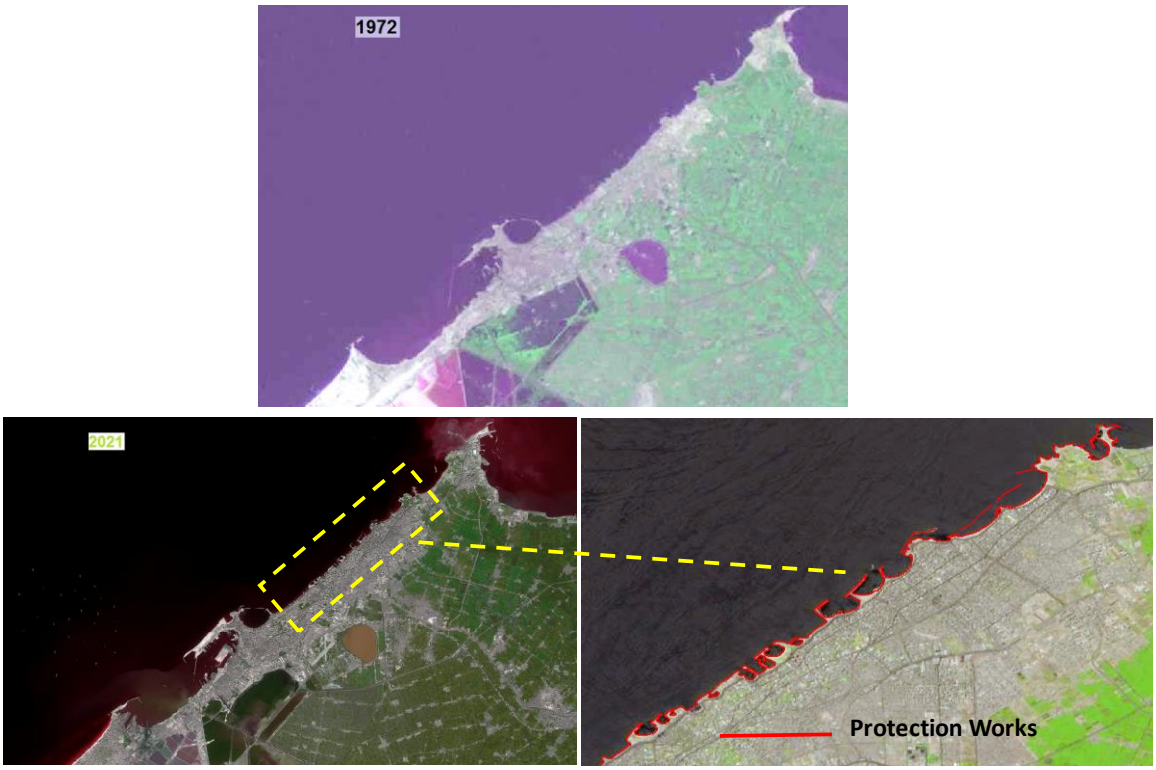

Figure 6: Progressive developments in Alexandria coastal strip during recent decades

Figure 7a: Example protection structures along Alexandria coastline- 500 years old QuaitBey Fort

Figure 7b: Example protection structures along Alexandria coastline- 500 years old QuaitBey Fort

Figure 7c: Example protection structures along Alexandria coastline- Muhammed Ali SeaWall –Abo-Quir Region

Figure 7d: Example protection structures along Alexandria coastline - AlManshia Area

Conclusion

Principal findings define an extent of the northern coastline of Egypt of about 1110 km, 15.8% of which is considered artificial. Protections are mostly concentrated in the Delta coast; for sustaining coastline stability, slowing witnessed retreat, curing accretion/sedimentation trends…etc. However, a number of protection works are related to developments, socio-economic activities such as recreational & leisure practices, ports and fish farming...etc.

Noticeable expansion with coastal tourism and Beach resort developments is detected towards the western sector of the Egyptian coastline. The least interference is found in eastern sector with more virgin shoreline and less artificial coastline and protection structures.

Advances in monitoring methodologies are remarkably achieved, especially with the evolving Earth Observation and Remote Sensing techniques. Such techniques facilitate more frequent update with acceptable accuracy and lesser cost.

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Abo Zed A. and Shereet S. (2005) “Dynamics of Near Shore Sediments and Coastal Changes Astride Rosetta Branch, Egypt”, Emirates Journal for Engineering Research, 10 (2), 51-61

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Downloaded NASA/USGS Landsat images from earthexplorer.usgs.gov, accessed in February/March, 2022

Annexes

Annex 1:

Data 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**
Ecological Objective	**EO8. Coastal ecosystem and landscape**
IMAP Common Indicator	**CI16. Length of coastline subject to physical disturbance due to the influence of manmade structures**
Parameter	**Location and extend of artificial structures**

Attribute table	Specify the following information in the attribute table associated with the GIS information layer:
	• CPCODE: Two-letter code of Country
	• ASCODE: Mandatory. Integer. Code of type of artificial infrastructure. The following code list should be used:
	  ○ 1 Breakwaters
	  ○ 2 Seawall/Revetments/Sea dike
	  ○ 3 Groins
	  ○ 4 Jetties
	  ○ 5 River mouth structures
	  ○ 12 Port and marinas
	• ASDES: Optional. Text. Description of type of artificial infrastructures
	• Municipal: Optional. Text. Name of municipality or local administrative region where the polygon of impervious surface is located
	• Year: Mandatory. Text. Year of production of the information layer

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

Content	Description
Ecological Objective	**EO8. Coastal ecosystem and landscape**
IMAP Common Indicator	**CI16. Length of coastline subject to physical disturbance due to the influence of manmade structures**
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	**EO8. Coastal ecosystem and landscape**
IMAP Common Indicator	**CI16. Length of coastline subject to physical disturbance due to the influence of manmade structures**
Parameter	**Artificial/Natural coastline**

Attribute table	Specify the following information in the attribute table associated with the GIS information layer:
	• CPCODE: Two-letter code of Country
	• ART_NAT: Mandatory. Integer. Code for type of segment of coastline. Use the following code list:
	  ○ 0 Natural coastline
	  ○ 1 Artificial coastline
	• Municipal: Optional. Text. Name of municipality or local administrative region where the polygon/polyline of segment of coastline is located
	• Year: Mandatory. Text. Year of production of the information layer
	• Ref_Year: Mandatory. Year of the reference coastline used to represent natural and artificial segments

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

Annex 2:

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 above GES definition and Proposed target(s) are just examples.		
Rationale		
Justification for indicator selection Mediterranean coastal areas are particularity 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 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 defense 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		

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

characterize coastal ecosystems on a wider Mediterranean basis. The status assessment of EO8 aims to fill this gap.

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Policy Context and targets

Policy context description

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

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 cultural 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.

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

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human-made coastline (hard coastal defense structures, ports, marinas (see Figure 1). Soft techniques e.g., beach nourishment are not included.

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.

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.

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Figure 1. Hard coastal defense 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 defense structures should be set to 10 m in order to classify such segments as natural, i.e. if the distance between two adjacent coastal defense structures is less than 10 m, all the segment including both coastal defense 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

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 to choose 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),

Ecological Objective 8:	The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved
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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. 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. Shape file with other GRS will also be accepted if provided with a complete .prj file that allows GRS transformations by standard GIS tools.

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

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
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.	
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