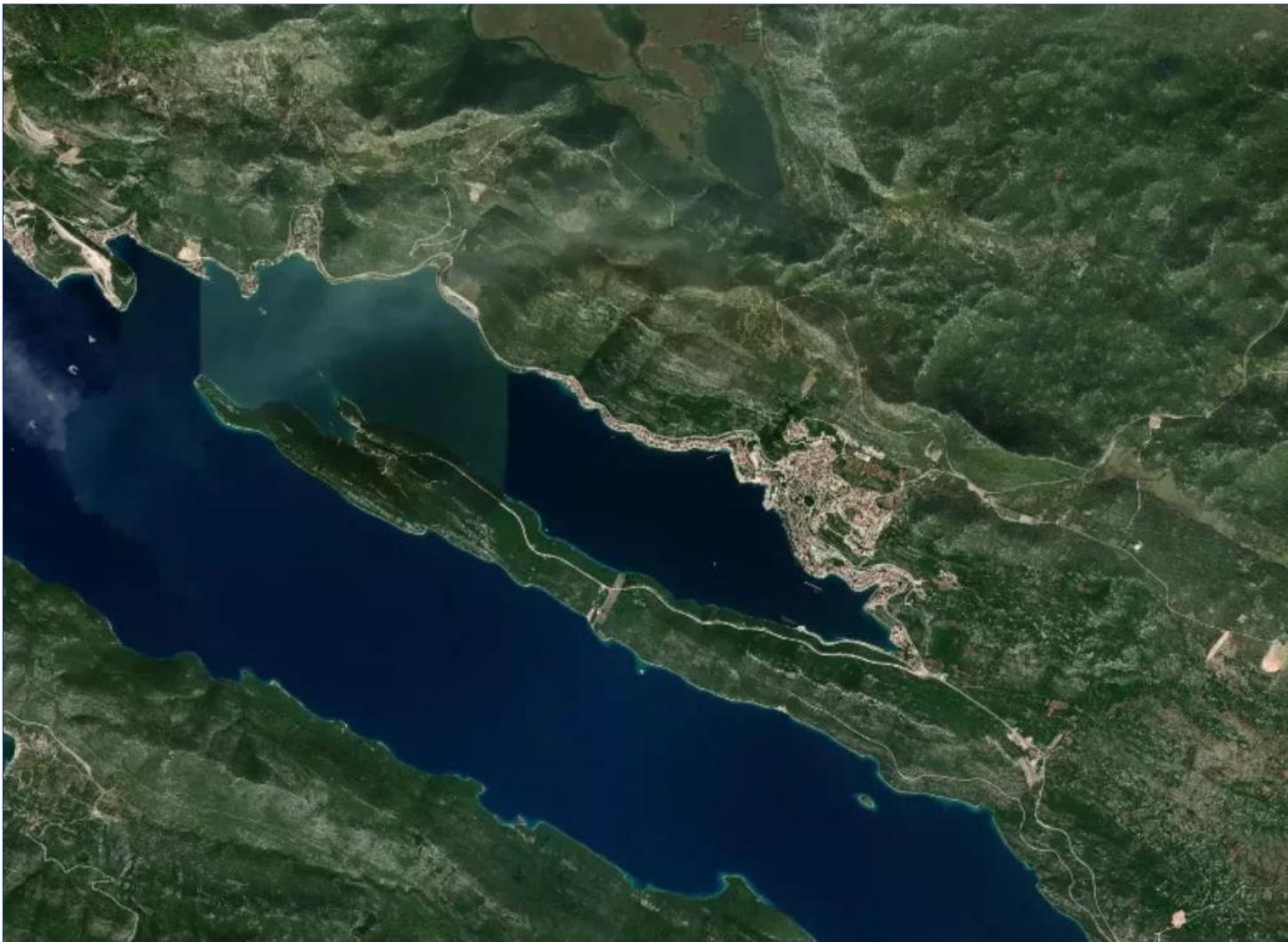


# Monitoring marine and coastal environment

## Monitoring Common Indicator 16



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## INTRODUCTION

Coastal Area Management Programme (CAMP) is being implemented by the Mediterranean Action Plan (MAP) since 1989. By now, CAMP projects have been implemented in almost all Mediterranean countries. The main objective of the MAP CAMP is to offer assistance to the Mediterranean countries in solving urgent environmental problems, and to introduce the integrated coastal zone management (ICZM) as the basic tool to achieve sustainable development at the selected sites in their coastal regions. All MAP Components have been involved in the hitherto implementation of CAMP projects.

Following a request presented by the Government of Bosnia and Herzegovina (BH), the Contracting Parties (CPs) to the Barcelona Convention approved the decision to carry out the CAMP for BH at their 19th Ordinary Meeting held on 9 – 12 February 2016 in Athens, Greece. The Feasibility Study (FS) for this project was prepared in the period January 2017– July 2018 and finally approved by the Council of Ministers in May 2020. The Agreement was signed on 29 June 2020 and opened the way for the implementation of this CAMP.

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

To prepare the report on monitoring of the Common indicator 16 for the whole Mediterranean coastline of Bosnia and Herzegovina by using the Guidance Fact Sheet where the method is

presented as well as the Information standards (Data Standards and Data Dictionaries) for the format of results to be uploaded to the IMAP info system.

The following reference documents should be taken into account that are integral part of the contract:

- *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”; and*
- *Information standards for the Common Indicator 16.*

Results, which are part of this report are:

- *Narrative Report with the presentation of the main characteristics of Bosnia and Herzegovina coastline and its coastal area; the main results of monitoring, difficulties encountered while monitoring, experiences. The main indicator units are:*
  - *Km of artificial coastline and % of total length of coastline.*
  - *Percentage (%) of natural coastline on the total coastline length.*
- *GIS layer (polyline; WGS 84 decimal degree): **Artificial\_structures** with location and extend of artificial structures, with attribute table; to be uploaded directly to IMAP Info system coordinated by INFO/RAC (Link/Password provided to responsible Info System User in Bosnia and Herzegovina)*
- *GIS layer: **Coastline\_AN**: Artificial/Natural coastline with attribute table.*

#### GENERAL DESCRIPTION OF THE BOSNIAN-HERZEGOVINIAN COAST

Although it looks like that, Bosnia and Herzegovina is not entirely landlocked. There is a narrow coast on the Adriatic Sea that surrounds Neum on the south in the Herzegovina-Neretva Canton. Neum is located on the hilly coast of the Bay Neum – Klek which is formed by mainland coast in and around Neum and Klek peninsula. The bay is six kilometers long and 1.2 kilometers wide with maximum depth of 27 meters. It covers an area of about 8 km<sup>2</sup>.

This small part of the coast is very indented like the rest of the coastline of the neighboring Republic of Croatia on the Adriatic Sea. Coast is geomorphologically built of cliffs, capes and accumulated pebble beaches.



*Figure 1 Bosnia and Herzegovina with location of the cadastral municipality Neum and associated sea in red*



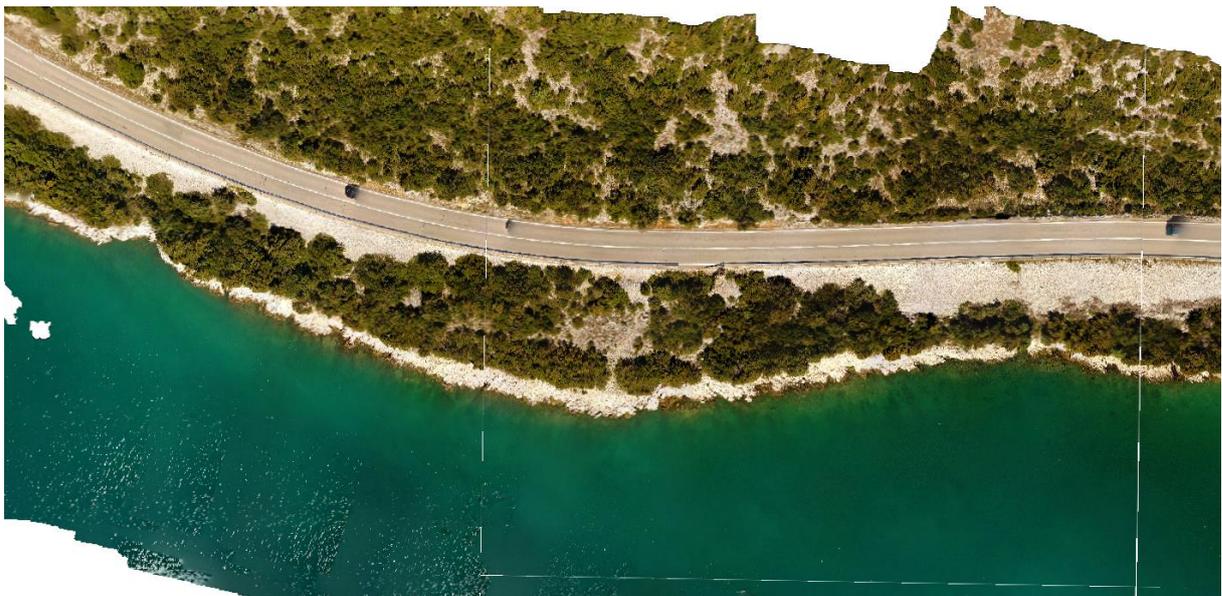
*Figure 2 Neum*

## METHOD AND INPUT DATA

Reference coast used for monitoring of the Common indicator 16 for the whole Mediterranean coastline of Bosnia and Herzegovina has been determined by Federal Administration for Geodetic and Property Affairs.

To determine whether the coast is natural or artificial and later the type of artificial coastline, orthophotos taken by the drone were used. Orthophotos were taken in 2016.

The length of artificial coastline has been calculated as the sum of segments on reference coastline identified as the intersection of polylines representing humanmade structures with reference coastline ignoring polylines representing humanmade structures with no intersection with reference coastline. The minimum distance between coastal defence structures is 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.



*Figure 3 Part of the orthophoto showing the natural part of the coast*

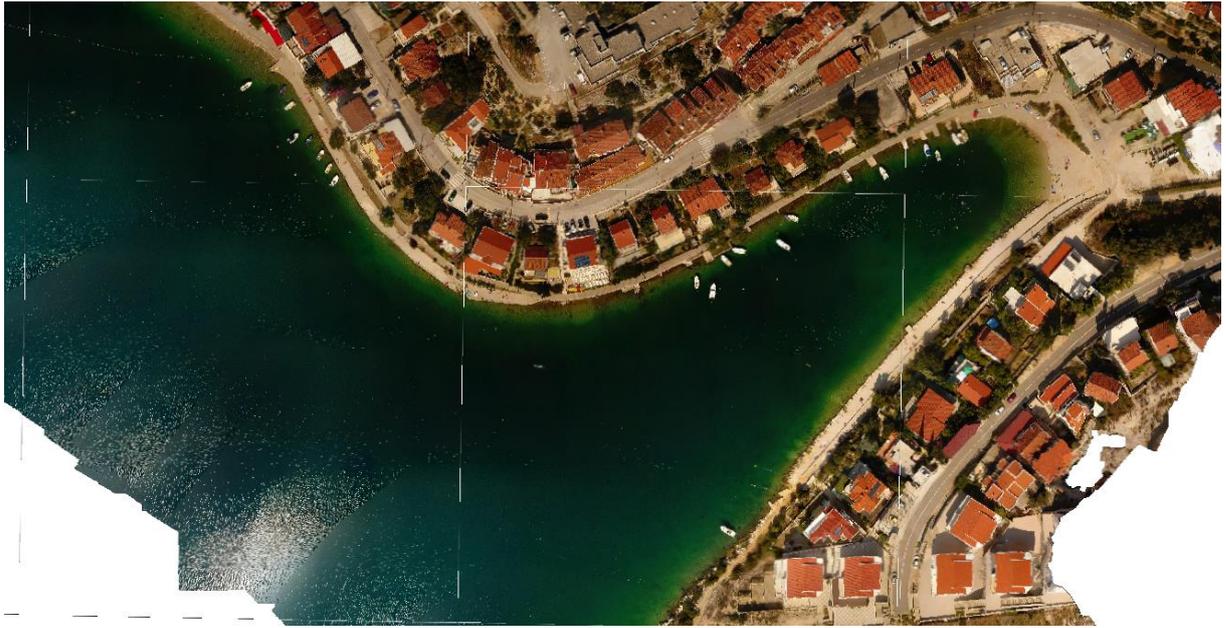


Figure 4 Part of the orthophoto showing the artificial part of the coast

## RESULTS

The results are prepared according to the Indicator guidance factsheet for E08 Coastal Ecosystems and Landscapes Common Indicator 16 “Length of coastline subject to physical disturbance due to the influence of humanmade structures” as two layers in shapefile format with required attributes. Layers are **Coastline\_AN** which describes whether part of the referent coastline is natural or artificial and **Artificial\_structures** which shows border on the sea side of coastal artificial structures and type of artificial infrastructure.

Attribute data is assigned according to the Information standards for the Common Indicator 16:

- *CPCODE: Two letter code of Country*
- *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 – Seawaters/Revetments/Sea dike, 3- Groins, 4 – Jetties, 5 – River mouth structures, 12 – Port and marinas)*
- *ASDES: Description of type of artificial infrastructure*
- *Municipal: Name of municipality or local administrative region where the polygon of impervious surface is located*
- *Year: Year of the production of the information layer*

The results of the analysis are shown in Figures 5 and 6 and Tables 1 and 2 below.

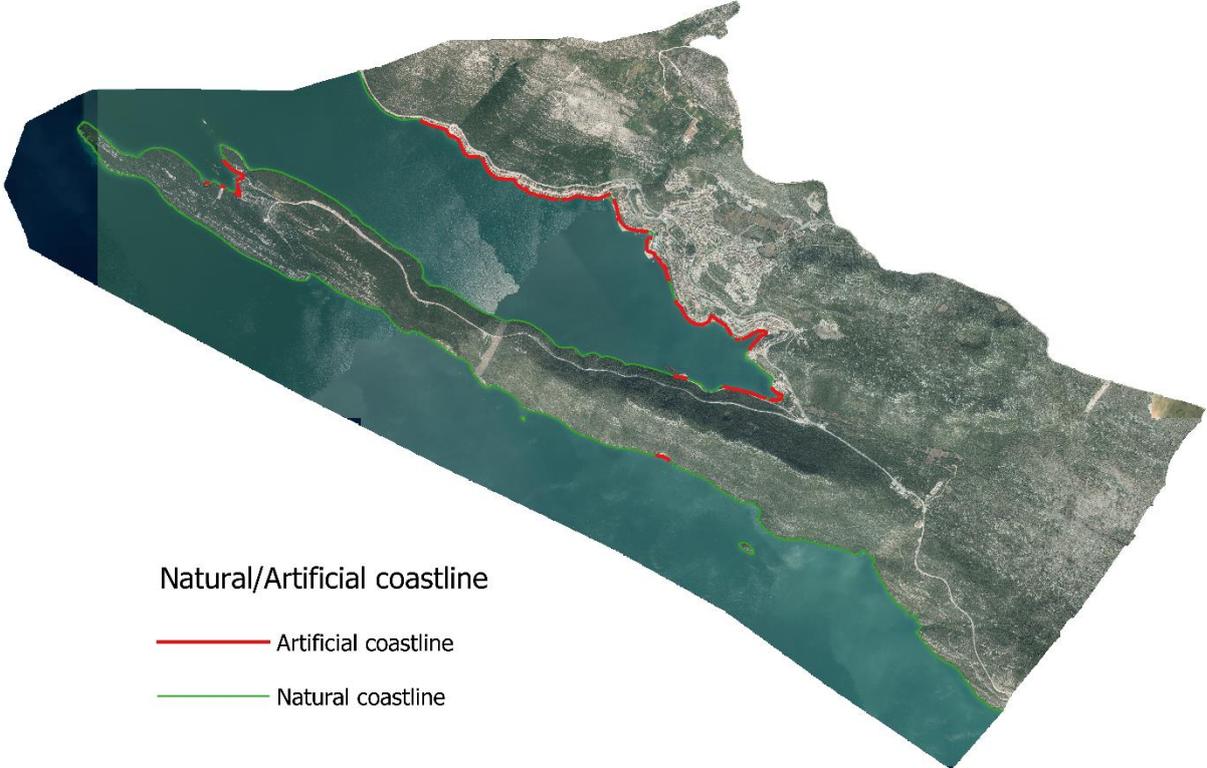


Figure 5 Spatial presentation of natural and artificial segments of the coastline

Table 1 Length and percentage of the natural and artificial coastline segments

ART_NAT	Length [km]	Percentage [%]
Natural coastline	21.2	81.1
Artificial coastline	4.9	18.9
TOTAL	26.1	100

As shown above, total length of coastline is 26.1 km, which is a bit longer than the official data of Bosnia and Herzegovina coast length, which is 21.2 km. The length of natural coastline is 21.2 km or 81.1 %, while length of artificial coastline is 4.9 km or 18.9 %. Figure 5 shows that the majority of

the artificial coast in the settlement of Neum, and the majority of the natural coast on the Klek peninsula.

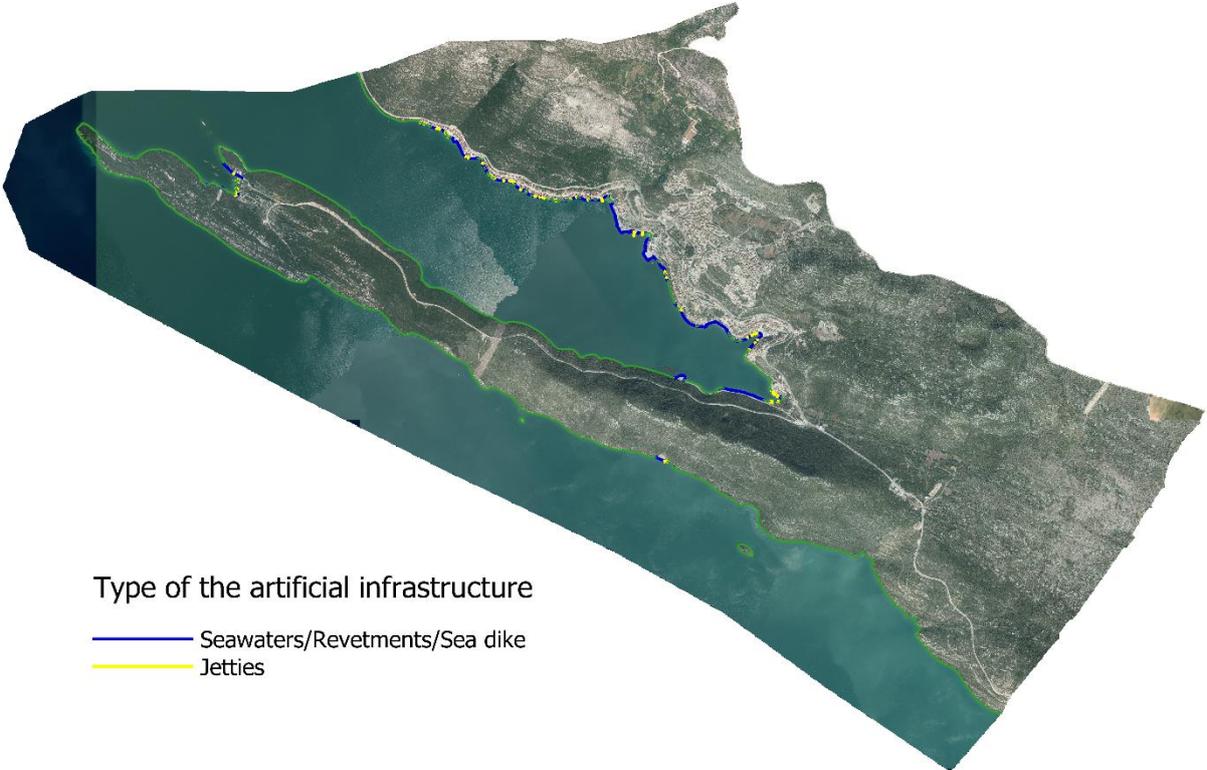


Figure 6 Spatial presentation of artificial infrastructure by type

Table 2 Percentage of different types of artificial structures

Artificial_infrastructure	Percentage [%]
Seawaters/Revetments/Sea dike	85.2
Jetties	14.8

Spatial distribution of different types of artificial infrastructure is shown on Figure 6, while Table 2 shows the representation of individual types.

## CONCLUSION

This report represents Common Indicator 16 “Length of coastline subject to physical disturbance due to the influence of humanmade structures” for the coastline of the Bosnia and Herzegovina. The length of natural coastline of the Bosnia and Herzegovina is 81,1%, mainly on the Klek peninsula. Artificial coast occupies a share of 18.9%, mainly in the settlement of Neum where many parts of the coast are concreted with the ratio of 85.2% for “Seawaters/Revetments/Sea dike”, and 14.8% for “Jetties”.

Digital data, two shapefiles with required attributes, were uploaded to INFO/RAC IMAP Info System and are integral part of this report.