TÜRKİYE Report

Ecological Objective 8

Coastal Ecosystems and Landscapes Common Indicator 16

Length of Coastline Subject to Physical Disturbance Due to the Influence of Human-Made Structures

December 2022

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Executive Summary

Türkiye's coastal areas are under the threat of rapid spatial change due to socio-economic development and effects of climate change. Especially in coastal settlements ports, marinas, breakwaters, groins, seawalls, jetties, superstructures, transportation and other infrastructures, land reclamation areas and constructions originating from the tourism sector are being built along the coastline. When these human-made developments and infrastructures on the coast are uncontrolled and unplanned without a holistic perspective, they cause irreversible damage to coastal areas, loss of habitat and biodiversity, physical deterioration of the coastline and have a destructive impact on the natural structure of the coast. For this reason, in order to protect biodiversity and prevent coastal erosion, UNEP MAP recommends member states to take coastal areas under control by monitoring the length of coastline subject to physical degradation due to man-made impacts since 2013 (UNEP/MED WG.471/6, 2019). This is also beneficial in terms of ensuring the sustainability of coasts, which are land-sea interaction areas.

This report has been prepared by the staff of the General Directorate of Spatial Planning based on the official coastal edge line in mainland Türkiye, without including islands. The report starts with a brief background about the study area. Moreover coastal areas, coastal planning system (maritime and terrestrial) and its evolution were mentioned. In the CI-16 monitoring part, methodology applied to the Mediterranean coastline of Türkiye was described. Within the result section, the report also discusses GES relation and CI-16 monitoring in Türkiye.

Introduction

Integrated Coastal Zone Plan and Management studies have been initiated administratively in Türkiye since 2007 in order to monitor coastal areas with a holistic perspective from an upper scale and to guide development in a sustainable manner. The first systematic monitoring study in Türkiye, which was also conducted in the second half of 2022, is an effort to quantitatively monitor or characterize coastal ecosystems holistically and homogeneously over larger areas. In this study, it is aimed to present the studies for the monitoring of the CI-16 indicator within the framework of the integrated coastal zone plan studies in Türkiye and the standards set by the UN-Environmental Program, as well as why and how to integrate the monitoring of the CI-16 indicator into Integrated Coastal Zone Plan and Management studies.

Coastal Areas and Planning System

The issue of utilization of coastal areas is defined in Article 43 of the Constitution, and in this respect, the Coastal Law No. 3621 published in 1990 and the Regulation on the Implementation of the Coastal Law set out the principles regarding the protection and use of coasts for public benefit, and the Ministry of Environment, Urbanization and Climate Change was authorized in this regard. Furthermore, subparagraph (i) of Article 102 of the Presidential Decree No. 1 authorizes the Ministry of Environment, Urbanization and Climate Change to approve Integrated Coastal Area Plans.

Integrated Coastal Zone Plan, as stated in Article 4 (b) of the Regulation of Making Spatial Plans. As stated in sub-paragraph (b) of Article 4 of the Spatial Plans Making Regulation, "An Integrated Coastal Zone Plan is a plan that addresses the coasts with an integrated approach including all sectoral activities and plans, social and economic issues together with the interaction area; ensures harmony between the functions and activities in the coastal areas and the objectives for the coastal areas; considers the protection of the coastal ecosystem and the use of natural resources in line with the principle of sustainable development; includes the necessary infrastructure facilities to be built on the coast related to transportation types; covers spatial objectives, strategies and action proposals and management plan in a way to ensure the balance of protection and utilization, in accordance with 1/25.000 or 1/50.000 scale, in accordance with schematic and graphic planning language, prepared in

cooperation with relevant institutions and organizations within the framework of strategic planning approach as a whole with the plan sheet and planning report".

On the other hand, subparagraph 1 of Article 6 of the Regulation under the heading "Chapter Three, Spatial Plan Staging and General Principles, Spatial plan stages and their relations" states that "Spatial plans are prepared as Spatial Strategy Plans, Territorial Plans and Zoning Plans in terms of the area they cover and their objectives".

In this direction, there are Territorial Plans approved in accordance with the Country Spatial Strategy Plan, which is at the top of the spatial planning level and is formed by feeding from the sectoral strategies and plans of implementing institutions and organizations. While the spatial strategy plan is at the country scale, the Territorial Plans direct the development at the regional scale. On the other hand, zoning plans and urban design projects are approved at the local scale in accordance with the Territorial Plans.

As stated in the Coastal Legislation, although integrated coastal area plans are not included in the definition of spatial planning, they mutually affect each other with the Territorial Plans on the one hand and direct the lower scale zoning plans on the other. The main reason for this is that in the Territorial Plans, only the existing and planned facilities on the seaward side of the official coastal line that have been included in the national investment program are included, no other proposals are made, and the investments related to coastal structures need to be coordinated at a higher scale.

In the Integrated Coastal Zone Management and Plans, approved by the Ministry of Environment, Urbanization and Climate Change within the framework of integrated coastal area management principles (UNEP/MAP/PAP, 2001), detailed technical research and analyses are carried out on coastal areas, which are among the areas most affected by climate change. In the meantime Integrated Coastal Zone Management and Plans guide sub-scale plans (zoning plans), feed back and elaborate the territorial plans on coastal areas , and detailed scientific research and studies on marine areas and coastal areas are carried out in addition to Territorial Plans. In addition, a holistic data inventory on coastal structures and facilities is created, contribution is made to ensuring environmental sustainability in land and water ecosystems, effective and holistic decision-making process on coastal investments is developed, and a coastal management model and monitoring system is established.

Integrated coastal zone management and planning efforts have been initiated since 2007. In this context, as a result of the status of the planning type in the legislation, the plan language and approach it uses, its transition to practice and the changes it has experienced over time, it can be argued that Integrated coastal zone management and planning have undergone 3 main change periods. The first generation plans are the strategic document plans that have been carried out under the name of integrated coastal zone management and planning since 2007. In the second generation integrated coastal area plans, which were started in 2014 with the introduction of the Regulation on the Construction of Spatial Plans into the legislation, unlike the first generation, solutions to the problems encountered in practice are sought and this second generation plans are integrated into spatial planning practice with their language and guidance. The coercive language of the first generation was re-evaluated in line with the current legislation and implementation practices, using a coercive language only when necessary, but primarily emphasizing its guiding aspect. In addition, new concepts such as coastal advisory units, coastal carrying capacity and port aggregation were introduced in the content of the plans.

As of 2017, Integrated Coastal Zone Management and Planning studies, which can be defined as the third generation, have been initiated, and the basis of these plans has been the effort to search for solutions to the problems related to sectoral, management and authority confusion in coastal areas. In this generation of plans, unlike the other plans, expert evaluation reports are prepared on 6 different subjects by field researches of relevant experts, literature review and opinions of relevant institutions and organizations: Expert Assessment Report on Coastal Structures, Expert Assessment Report on Maritime Transportation, Shipping and Logistics, Expert Assessment Report on Coastal Legislation and Planning, Expert Assessment Report on Tourism and Fisheries Coastal Structures and Aquaculture, Expert Assessment Report on Coastline Bathymetric and Oceanographic Measurements, and Expert Assessment Report on Marine Ecosystem. Nevertheless, coastal planning has undergone a transformation to provide input to maritime planning and has increased its extent in the maritime domain. At this point, it has gained a new concept, which is also called the land-sea interaction interface, different from terrestrial planning.

In the third generation plans, the concept of coastal silhouette was introduced. In this term structures and formations that disrupt the silhouette in the coastal view from the sea were identified and it was recommended that the relevant administrations take action against them.

In addition, comprehensive surveys are conducted during the plan studies and the opinions of coastal users are taken directly.

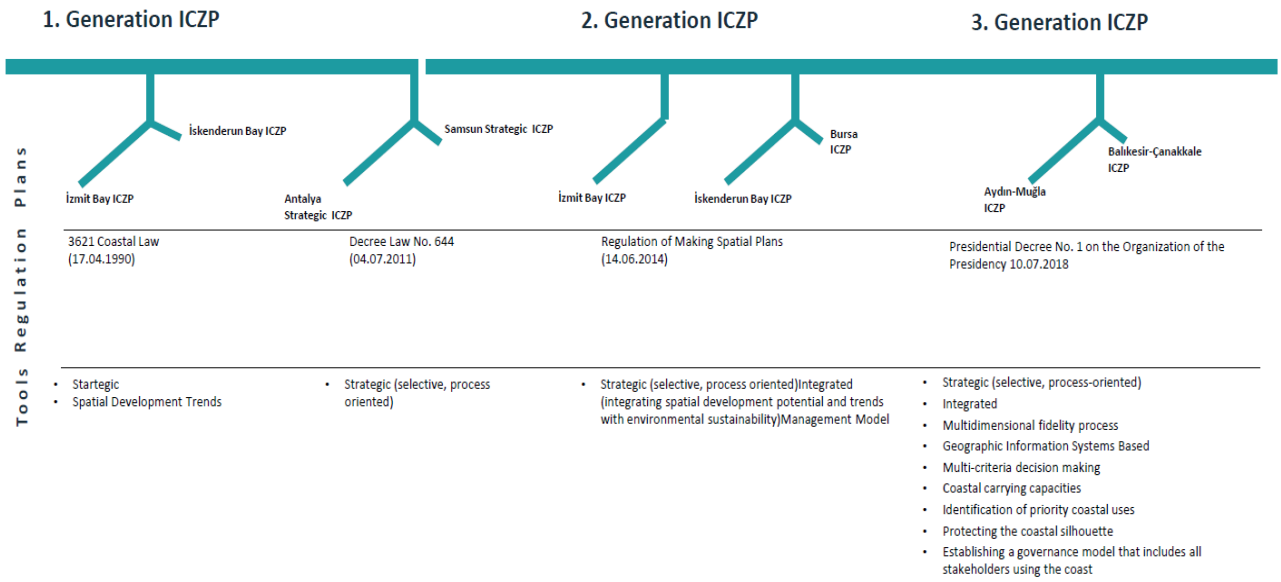

Figure-1: Generations and Development in Integrated Coastal Zone Plans (Source: Prepared by the authors)

Another innovation brought by this generation of plans is the use of Geographic Information Systems-based multi-criteria decision-making method to generate scientific data that will form the basis for the site selection of coastal structures. This method ensures that the studies to be carried out in order to evaluate the environmental impacts of a planned activity in coastal areas are systematic, objective and interdisciplinary. In addition, comprehensive studies should be carried out for the selection of the most appropriate location of the coastal structure in terms of spatial, physical, environmental, ecological and economic aspects.

In addition, since 2020, Integrated Coastal Zone Management and Planning studies have been subjected to the Strategic Environmental Assessment process, and since 2021, the environmental sensitivity of the plans has been maximized by adding the risks of natural disasters that may occur due to climate change among the evaluation criteria in the multi-criteria decision-making method that forms the basis of the plans. In other words, although Türkiye is not a party to the Protocol on Integrated Coastal Zone Management in the Mediterranean, it is seen that the coastal zone planning

methods recommended to countries under this Protocol are integrated into integrated coastal zone planning practices in Türkiye.

CI-16 Monitoring

Under the umbrella of the United Nations, there are other tools to protect marine and terrestrial ecosystems in coastal areas. The Integrated Monitoring and Assessment Program is one of these tools, which aims to develop effective management measures to minimize the negative impacts of human activities on coastal areas within the framework of socio-spatial, economic and cultural characteristics of countries.

In this context, the Integrated Monitoring and Evaluation Program has 11 ecological targets. These are biodiversity, non-native species, commercial species, seafood nets, eutrophication, hydrography, coastal ecosystems and landscapes, contaminants, marine litter, underwater noise. "Common Indicator 16 - Length of coastline exposed to man-made structures", defined within the framework of Coastal Ecosystems and Landscapes, is an obligation for the Parties to the Barcelona Convention to monitor their Mediterranean coasts and report on the monitoring in 6-year periods, and then to define the good environmental status specific to the coastal areas of each country.

At the Conference of the Parties to the Barcelona Convention (COP22) held in Türkiye on 7-10 December 2021, it was stated that Türkiye should monitor and report on Common Indicator 16 in accordance with the standards set by the UN. In this context, the monitoring of the Mediterranean coasts on the Turkish side was completed in the second half of 2022 and the length of Turkish coastline degraded by exposure to man-made structures was determined only on the basis of the mainland, without including islands.

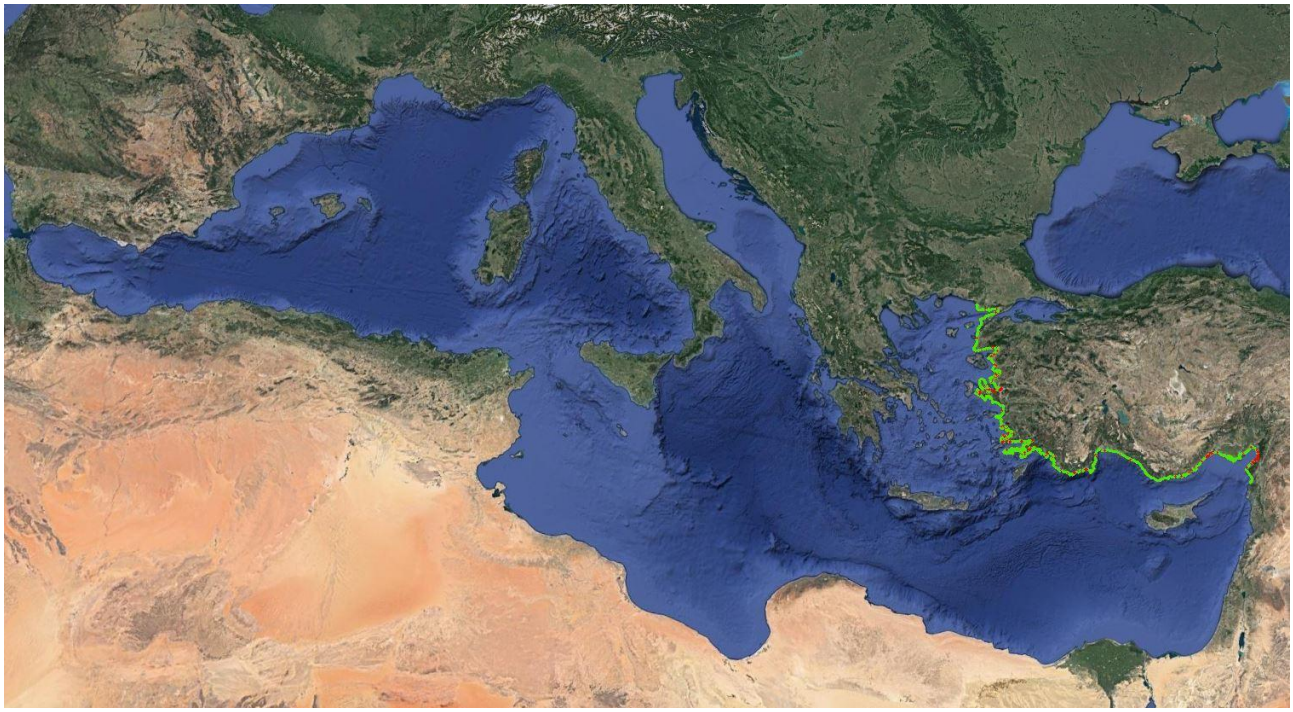

Figure 2: Coastal line monitoring platform (digitalsehir.csb.gov.tr/kiyikenar, source: digitalsehir.csb.gov.tr/kiyikenar)

Data and Methods

Within the scope of monitoring activities, a coastal line monitoring platform was established by the Ministry of Environment, Urbanization and Climate Change- General Directorate of Geographical Information Systems. This platform uses high-resolution orthophotos taken by different institutions on various dates as a base. Accordingly, coastline photographs taken by the Under secretariat of Maritime Affairs in 2009, Türkiye Orthophotos (2015) with a resolution of 10 cm, and Google maps with current (2020-2021) details were used.

As it is known, the measurement of coastal length is a problematic area that changes according to scale sensitivity and includes the fractal approach, as Mandelbrot stated the concept of "length" is usually meaningless for geographical curves. They can be considered superpositions of features of widely scattered characteristic sizes; as even finer features are taken into account, the total measured length increases, and there is usually no clear-cut gap or crossover, between the realm of geography and details with which geography need not be concerned (Mandelbrot, B., 1967). Measured length of a stretch of coastline depends on the scale of measurement. Empirical evidence suggests that the

smaller the increment of measurement, the longer the measured length becomes. There are various scientific approaches (Galloway and Bahr, 1979) that try to measure shore lengths with the fractal approach. However, if these approaches are accepted and implemented jointly by all countries in the Mediterranean, it is possible to make a comparison with the lengths of coasts between countries.

In this framework, in this study using base maps with a resolution of 10 meters, the lengths of the coast and therefore the length of the artificial coast were found to be longer than the previously measured lengths. For this reason, it is thought that using the ratios instead of with the lengths will give a more comparable result.

Based on these data, the natural coastline and artificial coastline were determined on the Mediterranean coast from Edirne-Greece border to Hatay-Syria border, taking into account the official coastal edge line. In addition, within the scope of the artificial coastline, coding was made within the scope of 7 artificial structure codes created by the UN according to the typologies of man-made coastal structures. Accordingly, coastal structure types and codes are as follows: 1-Break Waters, 2-SeaWalls/Coastal Bend, 3-Groins, 4-Jetties, 5-River mouth structures, 12-Ports and marinas, 21-Coastal Improvement/reclamation.

<table>
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<td>a) Example of artificial and natural coastline determination within the scope of Seawall and Groins</td>
<td>b) The minimum distance between coastal protection structures must be 10m. If the distance between two adjacent coastal protection structures is less than 10m, this part</td>
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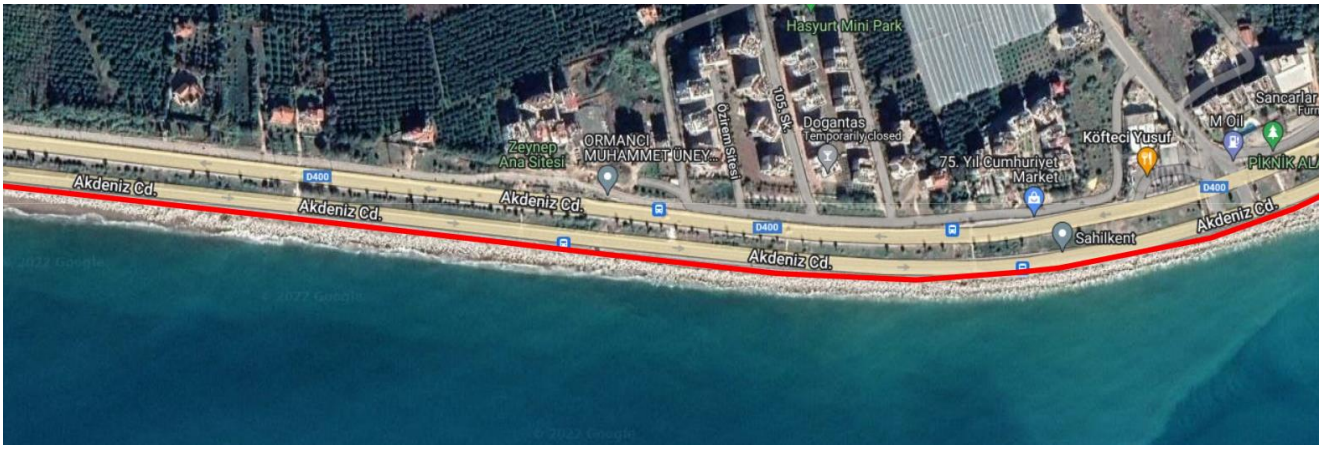
	is also classified as artificial.
	
c) Groins and Breakwaters	

Figure 3: Examples of artificial and natural coastline determination within the scope of Code 1-Breakwaters, Code 2-Seawall/Coastal Bend and Code 3-Groins

Different examples of natural and artificial coastline determination along the Mediterranean coast are given in the following figures:

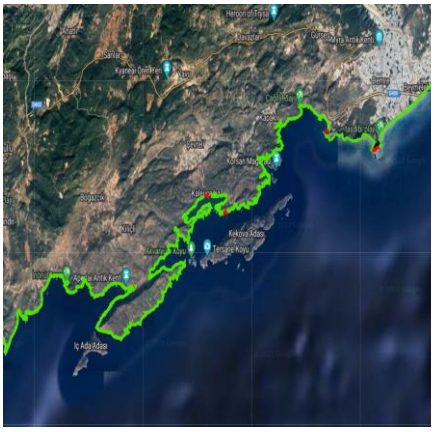
	
a) Port and Marinas	b) Port, Marina and Natural Coastal Areas



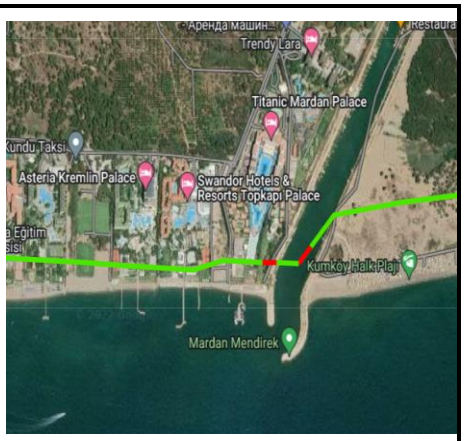
c) Land reclemation

Figure 4: Example of port, marina and coastal improvement in Turkish Coastal lines

Land reclamation



Natural and artificial coastal areas are determined only on the basis of mainland, islands are not included in the assessment.



River mouth structure

River mouth structure

Jetties

Groins

Figure 5: Example of coastal improvement, Land reclamation, river mouth strucure, Groin and Jetties

Monitoring Results

This study, which analyzed the Mediterranean coast of Türkiye, is very important in terms of creating a basis for the strategies to be created for the next monitoring period with various striking results. The study revealed that approximately 6.55% of the total coasts are degraded in a human-made way. We can categorize the artificial areas, from the most to the least, respectively as the following: Land reclamation, Port and marinas, Groins, Jetties, River mouth structures, Seawater/Revetments/Sea dike and Breakwaters.

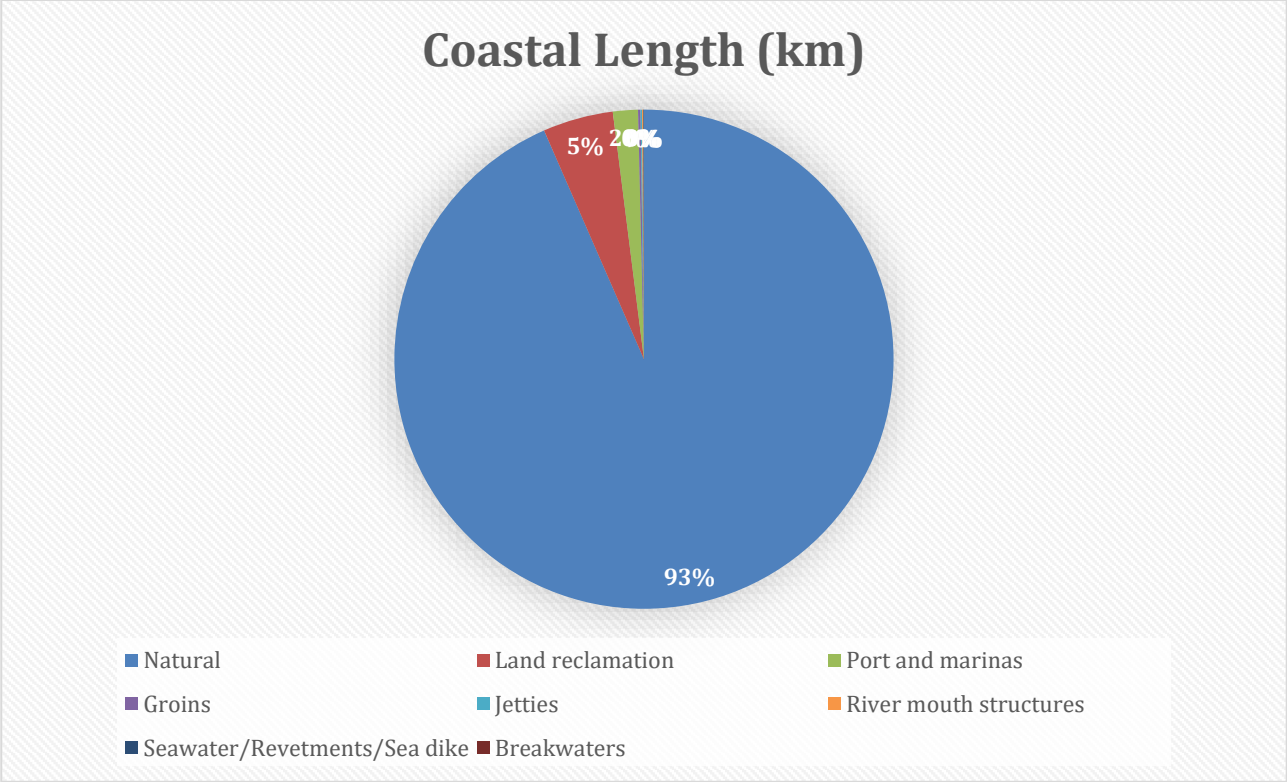


Figure 6: Ratio of Natural and Artificial Coastal Structures

When the artificial coastal structure is ranked among themselves; Land Reclamation, mostly built to gain land on the coast, is the most common, followed by Ports and Marinas. Of these two types of structures, land reclamation has a direct relationship with activities on land, while Ports and Marinas choose a place on the coast for both land and marine activities.

Figure 7: Length ranking of artificial coastal structures

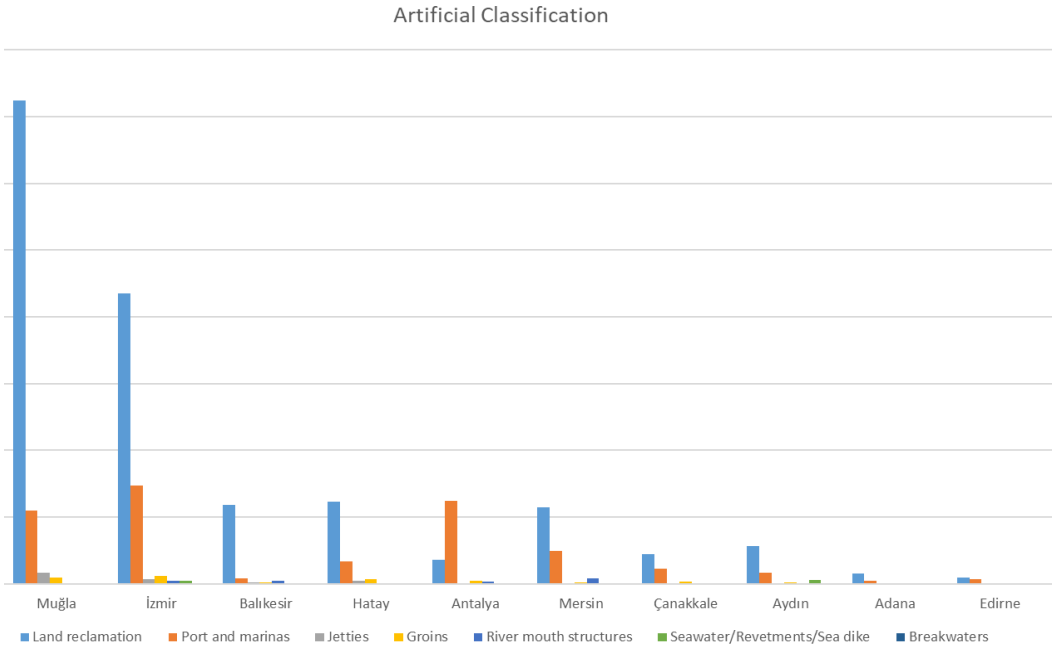


Figure 8: Artificial Structure classification by province

When artificial coastal structures are ranked by provinces, the amount of artificial coastal structures is high in provinces with high urbanization rates on the coast. When these are ranked on the basis of provinces Hatay, Balıkesir and İzmir, which are the provinces with the highest amount of artificial coastline according to the coastal length of the province.

Discussion and Conclusion

With this study, Türkiye's Mediterranean coasts were monitored, natural and other coastal areas which have been degraded and artificialized as a result of natural and man-made structures were identified. This monitoring result belongs to the year 2022 and is the basic data that will form the basis for the monitoring to be carried out in the following 6-years periods.

The aim of this study is not only to carry out this monitoring and to obtain basic monitoring data, but also to open the issue of how to integrate this data into integrated coastal zone plans and thus to take another important step in the realization of sustainability and economic development by protecting the ecological structure of coastal areas. In the next step, based on the results of the monitoring data obtained and by using the data of the integrated coastal area plans approved, "good environmental status" (UNEP/MAP (2013) will be determined for the Mediterranean coasts of Türkiye.

Good Environmental Status of marine waters (GESoM) refers to the state that the coastal Member States should achieve by 2020 in the seas within the framework of the Marine Strategy Framework Directive (MSFD). In this context, 11 descriptors are described.

Within the scope of the "Capacity Building Project on Marine Strategy Framework Directive in Türkiye (MARinTURK)", which was completed in 2018 and carried out within the framework of the European Union Pre-Accession Assistance Project - Instrument for Pre-Accession Assistance (IPA) Component I, of which the Ministry of Environment, Urbanization and Climate Change is the beneficiary; the good environmental status specific to the marine waters of Türkiye was defined as follows: "*The environmental state of ecologically diverse, dynamic, clean, healthy and productive marine waters (Article 3(5) of the MSFD)*"

In the light of this data, a method to determine good environmental status of coastlines (GESoC) will also be developed in Türkiye for the first time. With this method, by also the evaluation of all other necessary data, it will be determined what percentage of coastal areas should be subject to construction in the next 6-years period and what percentage should be preserved in its natural structure. However, in order to achieve good environmental status in Turkish coastal areas, an implementation tool is needed. It is obvious that this implementation tool is integrated coastal area plans. In this context, integrated coastal area plans will both be used as data for determining the good environmental status and as a tool to put the determined good environmental status into practice.

On the other hand, in order to ensure fairness between developed countries, which have mostly completed the construction of their coastal areas, and undeveloped countries, most of whose coastal areas are still natural and the need for construction may be quite high in the coming years, it is necessary to define threshold values according to the level of development in the GES Definition.

As a result of the monitoring of coastal areas completed in the second half of 2022, a definition of Good Environmental Status will be made for the first time for the coastal areas of Türkiye, as stated above, and the monitoring results of the next 6 years will be evaluated according to this definition. In this context, what needs to be done in the next phase of the study is as follows:

As good environmental status should be defined differently for different countries, considering the length of the coastal areas of Türkiye and the diversity of the coastal areas and backwaters, zoning is required for the definition of GES.

In zoning, local policies, development level and socio-economic status of the settlements bordering the Mediterranean Sea as well as national policies should be taken into consideration. For this reason, zoning can be done within the scope of integrated coastal area plans or on a provincial basis. In addition, capacity projections determined for coastal structures in the integrated coastal zone plans recently approved by the Ministry of Environment, Urbanization and Climate Change will be used in determining the GES. Following the determination of the GES, the overlap level of the defined GES will be determined with the monitoring to be carried out again 6 years later using the same methodology. In this way, the level of target achievement will be revealed. Monitoring results and target achievement levels will be regularly reported to the UN every 6 years.

In this way, monitoring methods and targets that will provide significant input to Integrated Coastal Zone Management and Plans will be put forward, contributing to the development of new and effective tools for the protection and sustainable use of Mediterranean coasts.

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Annexes

Annex-1

Table 1: Artificial and Natural coasts (Km)

Breakwaters	0.091008065
Groins	8.9701
Jetties	5.4776
Land reclamation	257.2397
Port and marinas	91.2788
River mouth structures	4.5706
Seawater/Revetments/Sea dike	2.3243
Natural	5274.8633

Annex -2

Data standards for the common indicator 16

GIS Information Standards:

- Artificial structures
- Artificial / natural coastline

Name of the GIS layer: Artificial_structures
GIS layer type: polyline
Geographical Reference Systems: WGS 84 degree decimal

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
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

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: o 0 Natural coastline o 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